The Drivers of Arctic Shipping & Marine Operations

ShipArctic 2015: A Joint WMU-IMO-Arctic Council Conference
World Maritime University, Malmo, Sweden ~ 25-27 August 2015

Lawson W. Brigham, PhD
Professor, University of Alaska Fairbanks
Chair, Arctic Council Arctic Marine Shipping Assessment (2004-09)
Topics ~ ShipArc Presentation:

- Arctic Perspectives & Global Links
- Changing Arctic Marine Access
  - Current Arctic Marine Use
- Arctic Marine Shipping Assessment (AMSA) ~ Scenarios & Recommendations
  - Summary Points & Challenges
The 21st Century Maritime Arctic

- Rapid & Profound Climate Change
- Globalization ~ Arctic Natural Resources
- Regional & Global Geopolitics
- Indigenous Peoples Challenges
New Arctic Resource Discoveries

“Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle”

-13% Undiscovered Oil
-30% Undiscovered Natural Gas
-20% Undiscovered Natural Gas Liquids

http://pubs.usgs.gov/fs/2008/3049/
Probability of Presence of Undiscovered Oil and/or Gas Fields

Coastal Seas

New Arctic Resource Discoveries

USGS (2008)
The ILULISSAT Declaration

- Conference of 5 Coastal States Bordering on the Arctic Ocean (Canada, Denmark & Greenland, Norway, Russia, USA)
  - 27-29 May 2008 ~ Ilulissat, Greenland
  - LOS/UNCLOS Provides ‘Solid Foundation’
  - ‘We therefore see no need to develop a new comprehensive international legal regime to govern the Arctic Ocean.’
The ‘New’ Maritime Arctic

Lukoil (Russia) & ConocoPhillips (USA)

Operator ~ Sovcomflot (Russia)
Builder ~ Samsung (Korea)
Technology ~ Finland, Canada & USA
Arctic Linkages to the Global Economic System

- International Fishing (10%)
- Global Marine Tourism Industry
- Hard Minerals ~ Palladium (40%), Nickel (22%), Diamonds (20%), Platinum (15%), Zinc (10%)
- Estimated Arctic Hydrocarbons ~ Undiscovered Natural Gas (30%) & Oil (13%)
- Potential: Rare Earths (25%), Coal & Fresh Water
- Regional Trade to Northern Communities & Infrastructure Development
The heating is not uniform geographically

Surface T in 2001-2005 vs 1951-80, averaging 0.53°C increase

J. Hansen et al., PNAS 103: 14288-293 (2006)
Arctic Sea Ice Minimum Extents ~ 2007 & 2012
Changing Summer Arctic Sea Ice Coverage ~ 1979-2012
Winter & Spring Months 2014 & 2015
Septembers 2006-2015

red lines= Polar Class 6 (e.g. commercial icebreaking ships)

blue lines= common open-water ships
Septembers 2040-2059

red lines= Polar Class 6 (e.g. commercial icebreaking ships)

blue lines= common open-water ships

Today's Arctic Commercial Marine Use

- **Hard Minerals**
  - World's Largest Zinc Mine
  - Mary River High Grade Iron Ore
  - Baffin Bay

**World's Largest Nickel & Palladium Mine**

- **Arctic Ocean Marine Routes**
  - Arctic Marine Shipping Assessment of the Arctic Council (2005-2008)
  - Northern Sea Route
  - Northwest Passage
  - Key Marine Routes
  - Notable Icebreaker Voyages:
    - *Arktika*, August 1977
    - *Sovetsky Soyuz*, August 1991
    - Polar Sea and *Louis S. St-Laurent*, July and August 1994
  - Sea ice, 16 September 2002
Today’s Arctic Commercial Marine Use

- Hard Minerals
  - Zinc & Coal
- Marine Tourism

Map of Arctic Ocean Marine Routes:
- Northern Sea Route
- Northwest Passage
- Key Marine Routes
- Notable Icebreaker Voyages:
  - Arktika, August 1977
  - Sovetsky Soyuz, August 1991
  - Polar Sea and Louis S. St-Laurent, July and August 1994
- Sea Ice, 16 September 2002

Map Key:
- Arctic Ocean
- Greenland
- Canada
- Russia
- Norway
- Sweden
- Finland
- Iceland
- Atlantic Ocean

Cities and Areas:
- Nome, U.S.A.
- Bering Sea
- Lancaster Strait
- Beaufort Sea
- Chukchi Sea
- East Siberian Sea
- Baffin Bay
- Arctic Circle
- Greenland Sea
- Barents Sea

Gulf of Alaska

Legend:
- 0 500 1000 1500 Kms.
- 0 270 540 810 Naut. Miles

Map by Mapping Solutions, Anchorage 2005 for L. Brigham, USARC
Today’s Arctic Commercial Marine Use

- Hard Minerals
- Marine Tourism
- Key Fisheries

Map showing Arctic Ocean Marine Routes and key areas such as Bering Sea, Lancaster Strait, Chukchi Sea, Beaufort Sea, and key locations like Nome, U.S.A., (Alaska), Baffin Bay, High Grade Iron Ore, Zinc & Coal, Nickel & Copper, and Arctic Circle.
Today’s Arctic Commercial Marine Use

- Hard Minerals
- Marine Tourism
- Key Fisheries
- Oil & Gas
Today’s Arctic Commercial Marine Use

- Hard Minerals
- Marine Tourism
- Key Fisheries
- Oil & Gas
- Summer Sealift

Future High Grade Iron Ore Mine ??

Map: Arctic Ocean Marine Routes
Arctic Marine Shipping Assessment of the Arctic Council (2005-2006)

- Northern Sea Route
- Northwest Passage
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Map by Mapping Solutions, Anchorage 2005
for L. Brigham, USARC
Today’s Arctic Commercial Marine Use

- Hard Minerals
- Marine Tourism
- Key Fisheries
- Oil & Gas
- Summer Sealift
- Exploration/Science

Future High Grade Iron Ore Mine ??
Icebreaker Transits to the North Pole & Trans-Arctic Voyages (1977-2014):

- 110 Transits to the North Pole (93 Russia, 7 Sweden, 3 USA, 3 Germany, 3 Canada, 1 Norway)
- Single Non-summer NP Voyage (*Sibir* Voyage May-June 1987)
- 66 Ship Transits to the NP in 2004-2014

‘Clear Evidence of Central Arctic Ocean Icebreaker Operations’

25 May 1987 ~ North Pole
Soviet Nuclear Icebreaker *Sibir*
‘A Walk Around the World!’
‘Wild Card’ Issue  ~ Summer Northern Sea Route Voyages Linking Arctic Russia & Northern Europe to the Pacific

NSR Transits:
2011~41 (25 RU+16 Int)
2012~46 (19+27)
2013~71 (44+28)
2014~53 (22+31)
Global Media Coverage:

- **Chinese Cargo Ship Sets Sail for Arctic Short-cut** (11 August 2013 ~ *Financial Times*) ~ [Notable: *Ob River* in Nov/Dec 2012 from Hammerfest to Tabeta, Japan]

- **100 Times to the North Pole**
  (2 August 2013 ~ *Barents Observer*)

- **Northern Sea Route Slated for Massive Growth; A Seasonal Supplement to the Suez Canal** (4 June 2013 ~ *The Moscow Times*)
Winter Maritime Traffic
1 January to 31 May 2013
Marine Exchange of Alaska
Summer Maritime Traffic
1 June to 30 November 2013
Marine Exchange of Alaska
Timeless Arctic Marine Transport: Indigenous Use of the Arctic Ocean
Arctic Council ~ Intergovernmental Forum
AMSA Lead Countries for PAME ~ Canada, Finland & USA
AMSA Focus ~ Marine Safety & Marine Environmental Protection
13 Major Workshops & 14 Town Hall Meetings

Key Challenge ~ Many Non-Arctic Stakeholders

2004 – 2009
Table of Contents

- Executive Summary with Recommendations
- Arctic Marine Geography Climate & Sea Ice
- History
- Governance
- Current Use/Database
- Scenarios to 2020 & 2050
- Human Dimensions
- Environmental Impacts
- Infrastructure

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AMSA Key Uncertainties for Future Arctic Marine Transportation

- Stable legal climate
- Radical change in global trade dynamics
- Climate change is more disruptive sooner
- Safety of other routes
- Socio-economic impact of global weather changes
- Oil prices (55-60 to 100-150 USD?)***
- Major Arctic shipping disasters***
  - Limited windows of operation (economics)
  - Rapid climate change
- Maritime insurance industry
- China, Japan & Korea become Arctic maritime nations
  - Transit fees
- Conflict between indigenous & commercial use
- Arctic maritime enforcement
- Escalation of Arctic maritime disputes
- Shift to nuclear energy***
- New resource discovery
  - World trade patterns
- Catastrophic loss or change in Suez or Panama Canals
- Global agreements on construction rules and standards
“Stricken cruise ship off Antarctic evacuated”

MSNBC - 11/23/07

M/V Explorer

100 passengers and 54 crew evacuated from sinking cruise ship

Chile
Argentina
Falkland Is
South Shetland Islands

PACIFIC OCEAN
Drake Passage

ANTARCTICA
Scenarios on the Future of Arctic Marine Navigation in 2050

**Arctic Race**
High demand and unstable governance set the stage for an economic ‘rush’ for Arctic wealth and resources.

**Arctic Saga**
High demand and stable governance lead to a healthy rate of development, includes concern for preservation of Arctic ecosystems & cultures.

**Polar Lows**
Low demand and unstable governance bring a murky and under-developed future for the Arctic.

**Polar Preserve**
Low demand & stable governance slow development in the region while introducing an extensive eco-preserve with stringent “no-shipping zones”.

AMSA/GBN Scenarios Workshops ~ April & July 2007
The Future of Arctic Marine Navigation in 2050
Enhancing Arctic Marine Safety

Protecting Arctic People and the Environment

Building the Arctic Marine Infrastructure

AMSA RECOMMENDATIONS (17) ~ THEMES
Enhancing Arctic Marine Safety

- Infrastructure Deficit
- Arctic Marine Traffic System+
- Environmental ++++

Protecting Arctic People and the Environment

- Indigenous Use+
- Community Engagement++
- Invasive Species
- Eco-Significant Areas++
- Oil Spill Prevention
- Marine Mammal Impacts
- Reducing Air Emissions

Building the Arctic Marine Infrastructure

- Hydrographic, Met & Ocean Data

AMSA RECOMMENDATIONS (17) ~ THEMES
AMSA 2009:

• Baseline Assessment

• Arctic Council Policy Document
  ~ Negotiated Text Approved 29 April 2009 ~

• Strategic Guide

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Summary Points & Challenges

• Arctic Natural Resource Development ~ Main Driver
• Greater Marine Access & Potentially Longer Navigation Seasons
  • NSR ~ Seasonal Supplement to the Suez Canal Route ~ Opportunities for Seasonal Trans-Arctic Voyages
• ‘New’ Suez & Panama Canals Add Capacity to Global Routes
  • Four Challenges:
    (1) Defining/Maintaining the Ice Navigation Season Length
    (2) Addressing the Huge Arctic Marine Infrastructure Gap
    (3) Implementing the IMO Polar Code & Uniformity
    (4) Projecting Plausible Ship Traffic Patterns/Trends