CNIIMF

Central Marine Research & Design Institute

Laboratory of Icebreaking Technology and Ice Performance of Ships

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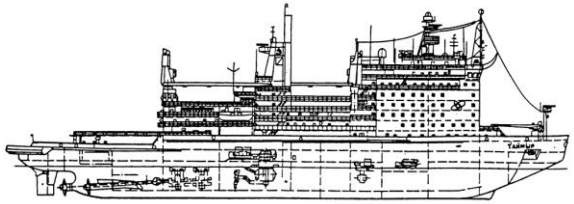
The NSR as an alternative to the southern sea transportation route between Europe and South-Eastern Asia

Moscow, 5 June 2012

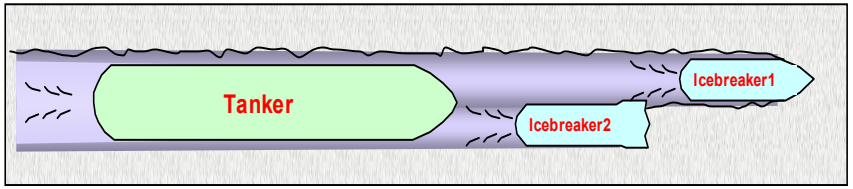
The basic lines of Laboratory of Icebreaking Technology activity

Forecast of the development of icebreakers and cargo ships

Feasibility study and optimization of principal parameters of ships and icebreakers



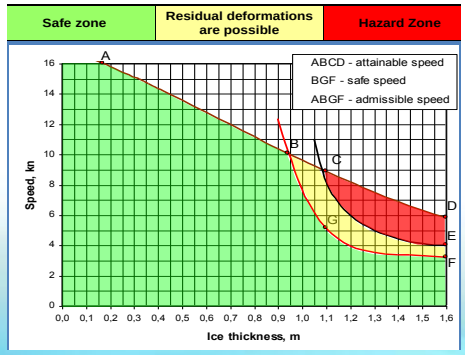
Mathematical modeling of the ship motion in ice



Expertise of icebreaker and ship designs

Acceptance and trial of new ships

Ice Certificates and Interim Recommendations on Ice Safety

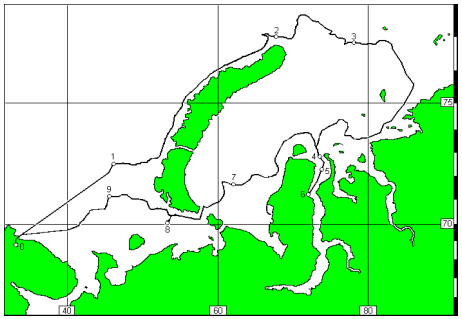


The basic lines of Laboratory of Icebreaking Technology activity

Participation in the development of the Register Rules and Regulations for navigation on the Northern Sea Route and freezing ports of the Russian Federation

Requirements to strength, propulsion and manoeuvrability as well as to propeller-rudder units and other means increasing the icebreaking capability

Recommendations for the selection of hull lines, ice class and power of ice-going ships



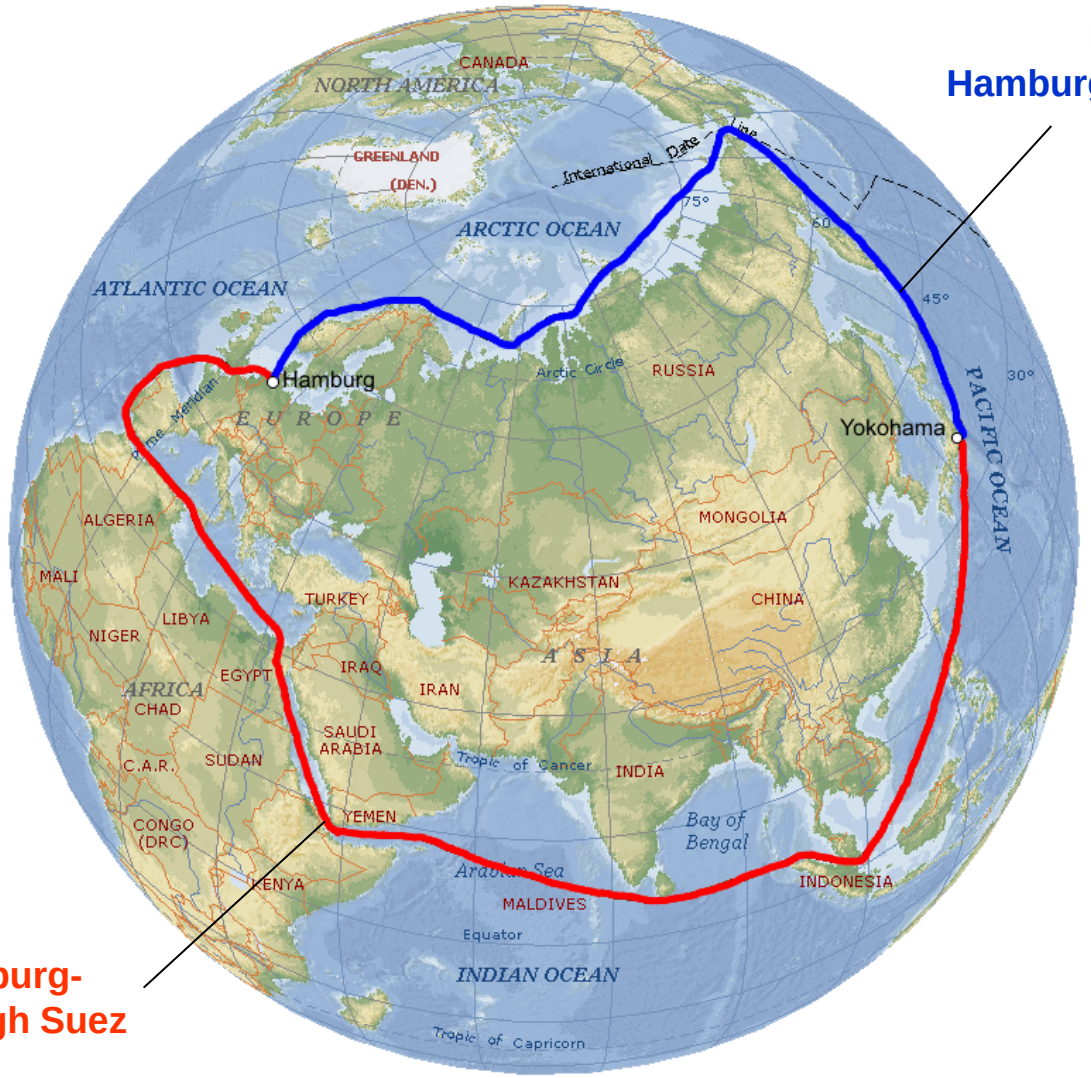
International shipping research projects INSROP, ARCDEV, ARCOP, AMSA

Unified IACS requirements, IMO Guidelines for ships operating in Arctic ice-covered waters and HELCOM recommendations on winter navigation in the Baltic Sea, Polar Code of IMO

Classification Society	Ice Class				
Russian Maritime Register of Shipping (Rules 2003)	LU8	LU7	LU6	LU5	LU4
Russian Maritime Register of Shipping (Rules 1995)	-	ULA	-	UL	L1
IMO Guidelines (IACS Polar Ship Rules)	PC2	PC3	PC4	PC5 / PC6	PC7
CASPPR, 1995	CAC2	CAC3	CAC4	A	B
American Bureau of Shipping	A4	A3	A2	A1	A0
Det Norske Veritas	POLAR-20	POLAR-15	POLAR-10 ICE-15	ICE-10 ICE-1A*	ICE-05 ICE-1A
Lloyd's Register	AC2	AC1.5	AC1	1AS	1A
Germanischer Lloyd	Arc3	Arc2	Arc1	E4	E3
Finnish-Swedish Ice Rules	-	-	-	1A Super	1A
Bureau Veritas	-	-	-	1A Super	1A
Nippon Kaiji Kyokai	-	-	-	1A Super	1A
Korean Register of Shipping	-	-	-	ISS	IS1
China Classification Society	-	-	-	B1*	B1
Registro Italiano Navale	-	-	-	1AS	1A

Consulting services to foreign shipbuilders and oil companies

Northern transit path Hamburg-Yokohama through NSR (7100 nm)

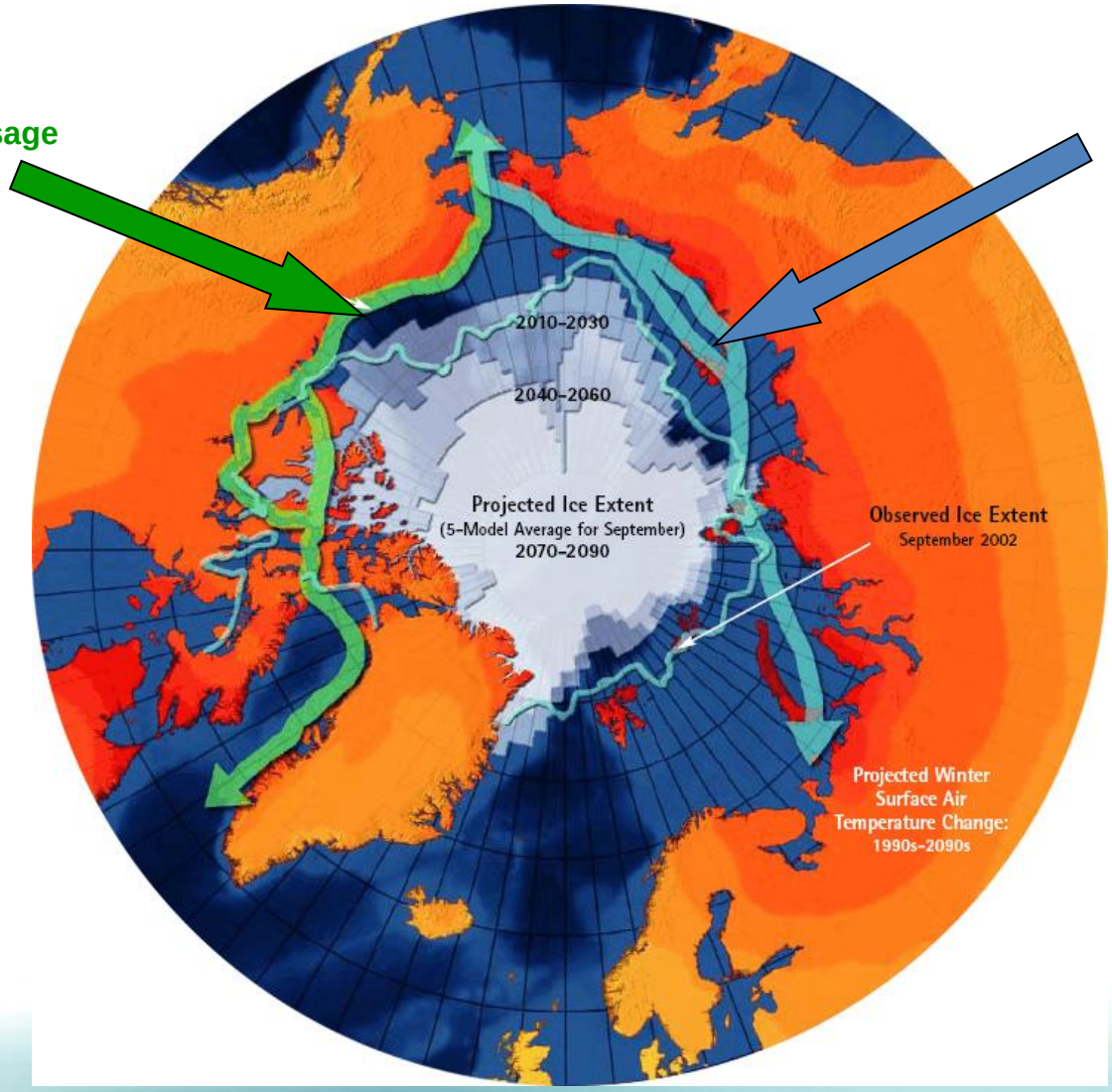


Southern transit path Hamburg-Yokohama through Suez canal (11580 nm)

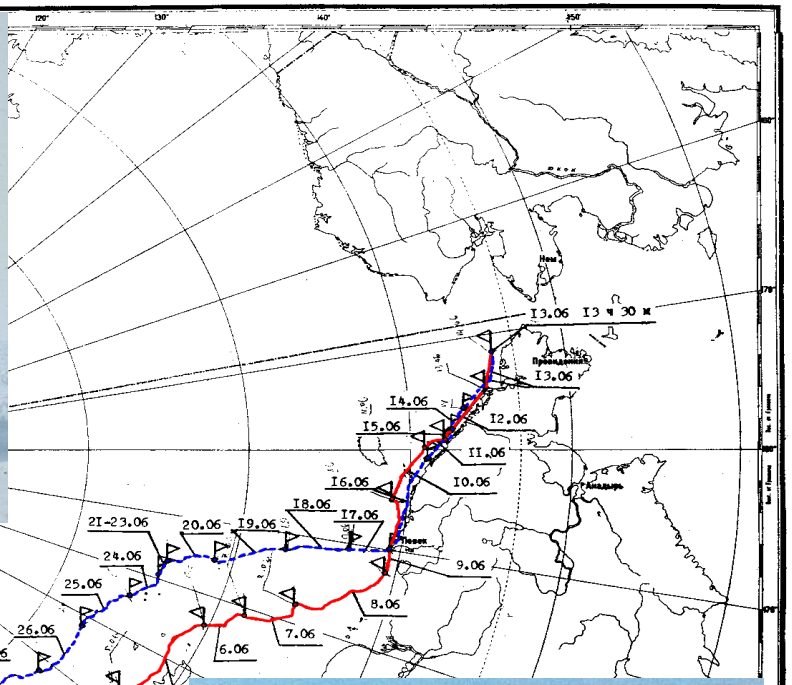
Forecast assessment of the area of ice cover in the Arctic (project AMSA – Arctic Maritime Shipping Assessment)

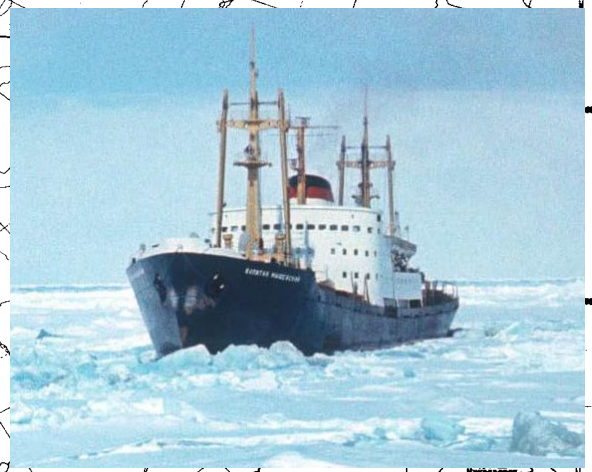
The North-Western Passage

The Northern Sea Route

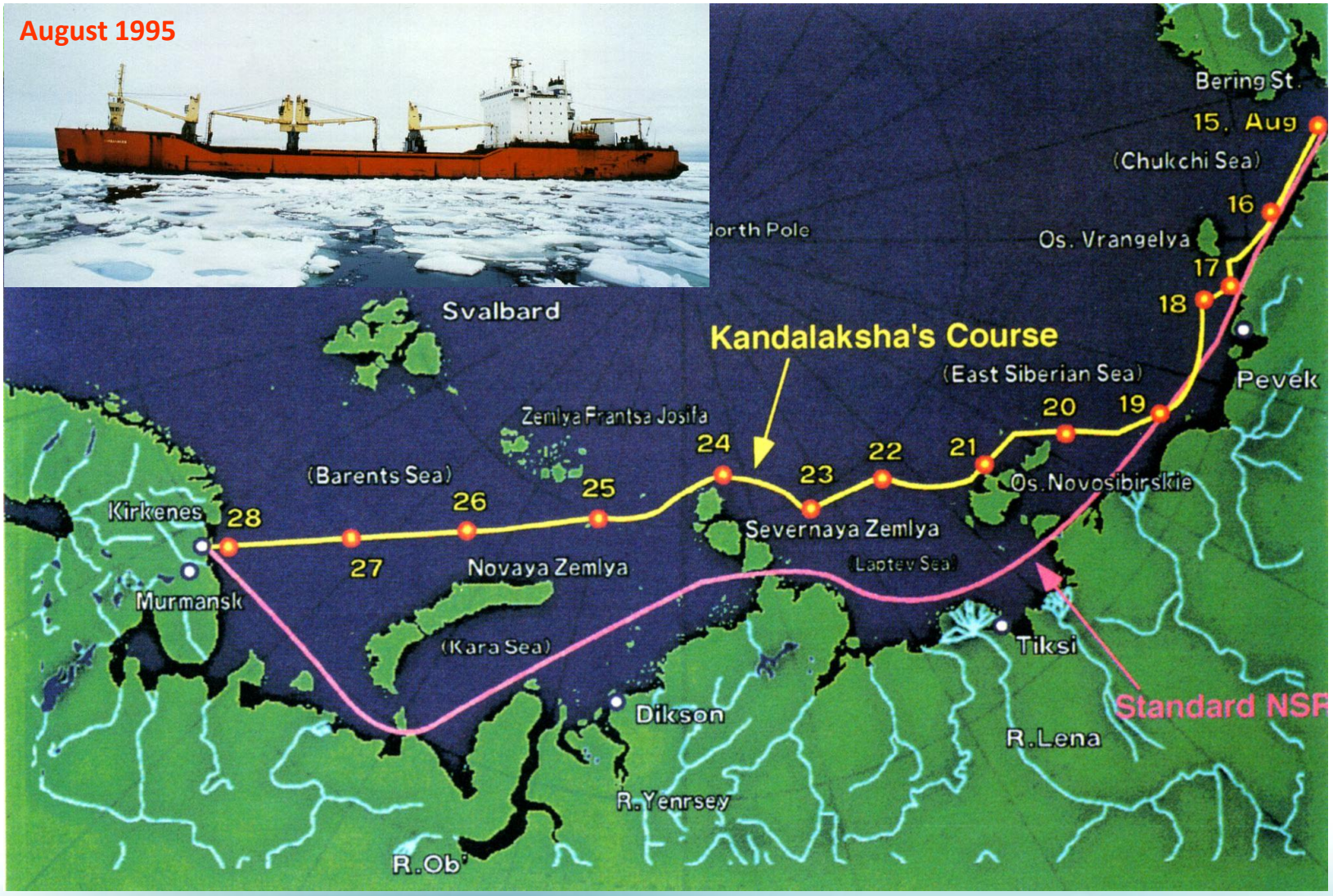


High-latitude route of m/v “Kapitan Myshevskiy” escorted by nuclear icebreaker “Sibir”

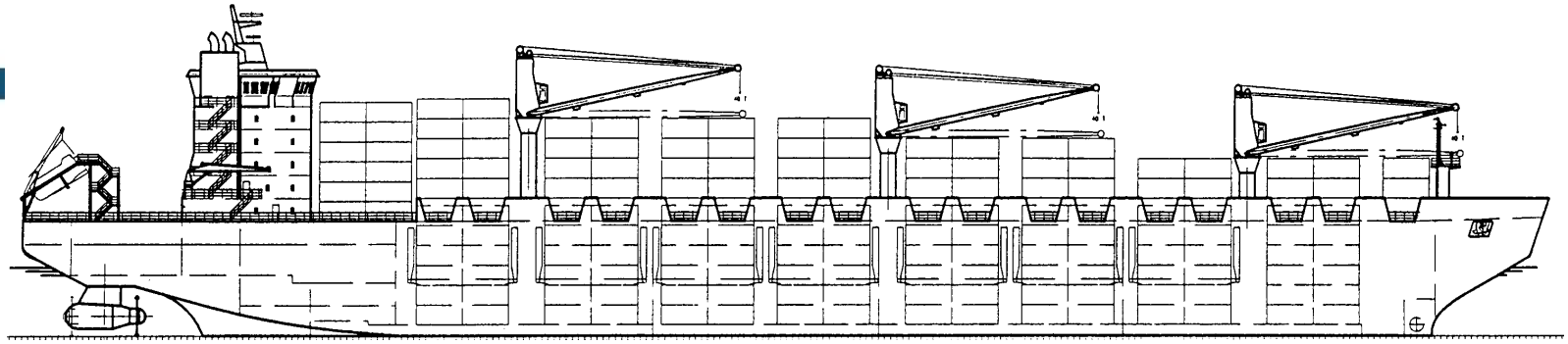




Transit commercial voyage of m/v “Kandalaksha” along the NSR within the framework of the international scientific program INSROP



Design of the arctic container ship with a capacity 2500 TEU



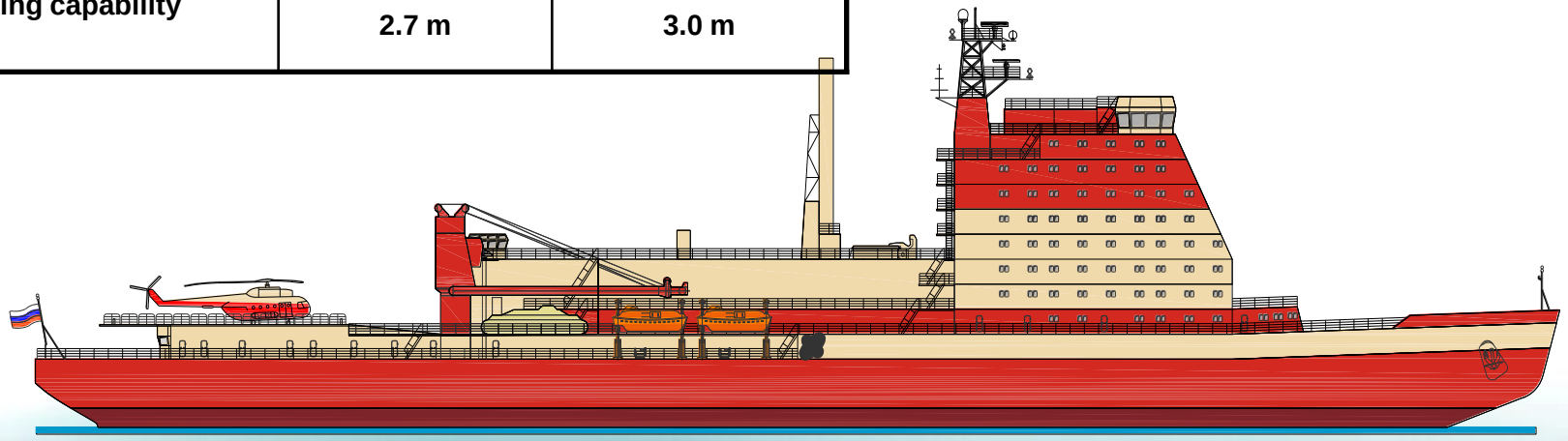
Conventional container ship with a capacity 2500 TEU with no ice class

Ice class	**Arc7**	**-**
Length	**252,0 m**	**210 m**
Breadth	**32,2 m**	**30,2 m**
Draft	**11,5 m**	**11,5 m**
Deadweight	**51000 t**	**34500 t**
Shaft power	**32 MW**	**21,5 MW**
Speed	**21 kn**	**22 kn**
Icebreaking capability	**2,0 m**	**-**

Characteristics of linear arctic icebreakers

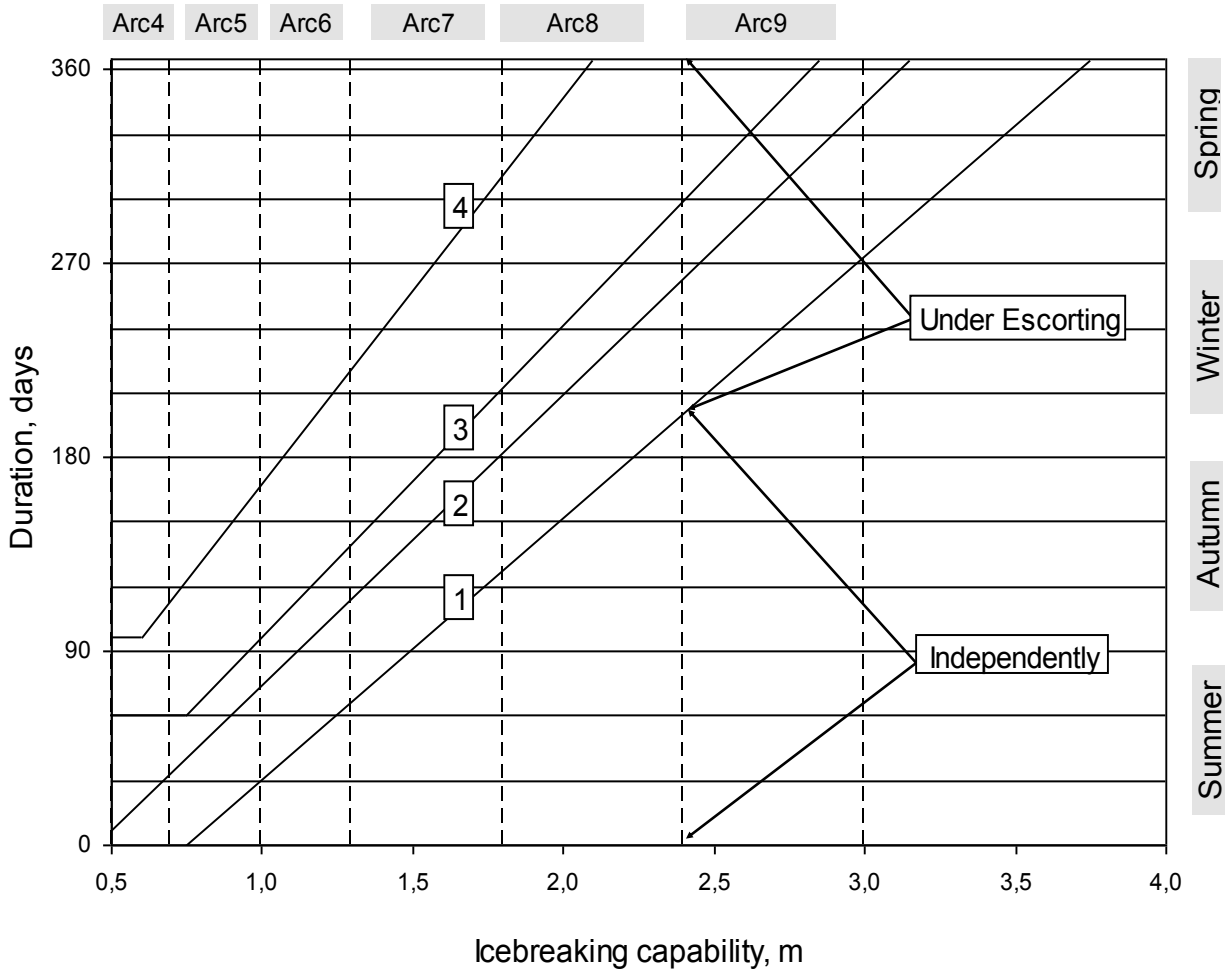
Characteristics	Nuclear icebreaker *«50 let Pobedy»*	New generation icebreaker LK-60
Ice class	Icebreaker 9	Icebreaker 9
Length	145.6 m	160 m
Breadth	28 m	33 m
Draft	11.0 m	10.5 m
Displacement	25700 t	33600 t
Shaft power	49 MW	60 MW
Speed	21.0 kn	22.0 kn
Icebreaking capability	2.7 m	3.0 m

Nuclear icebreaker



Design of 60 MW universal nuclear icebreaker

Duration of the independent navigation of cargo ships along the seaways of the NSR versus their icebreaking capability



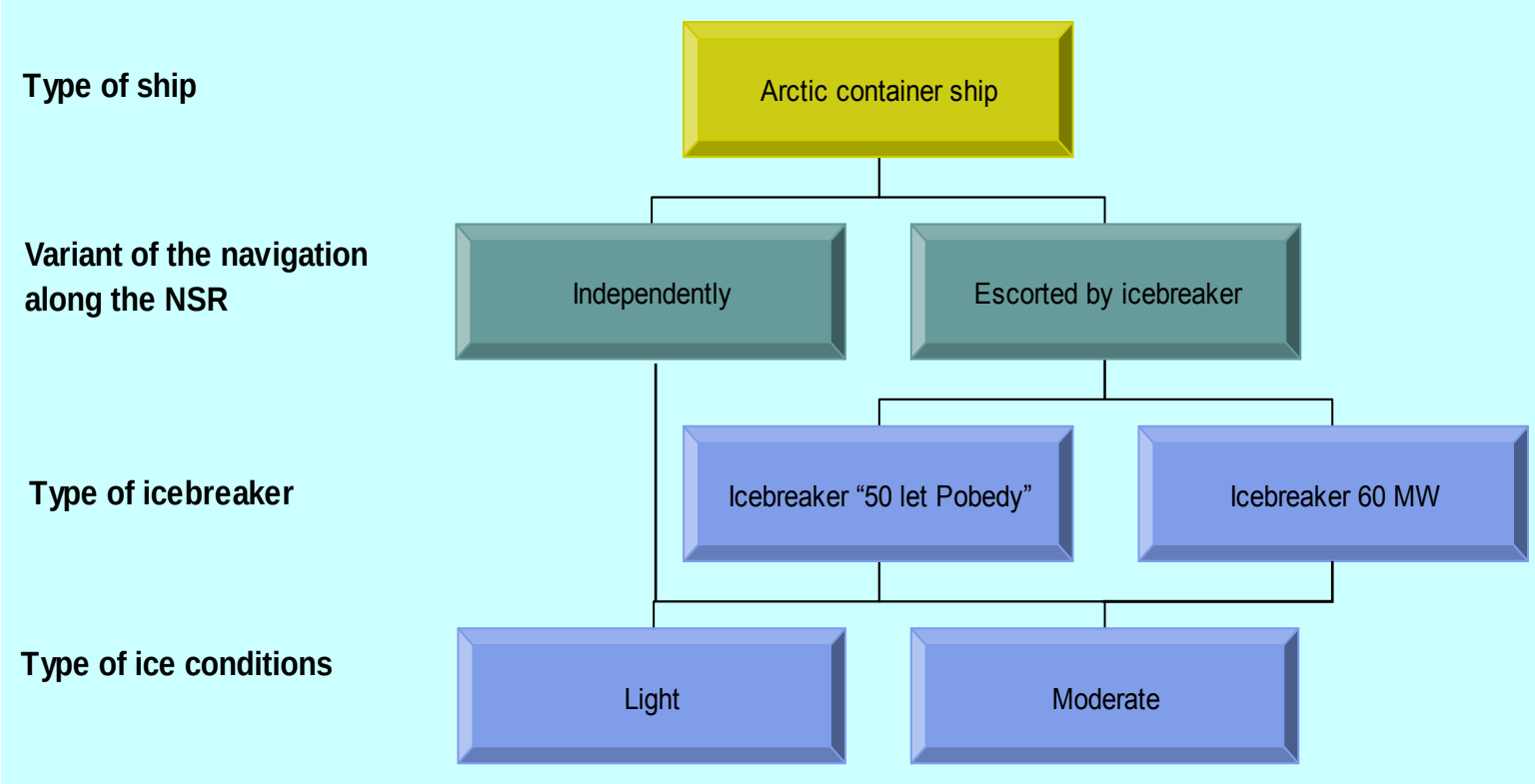
1 – in transit navigation along the NSR and in the East Arctic region,

2 – in the West Arctic region,

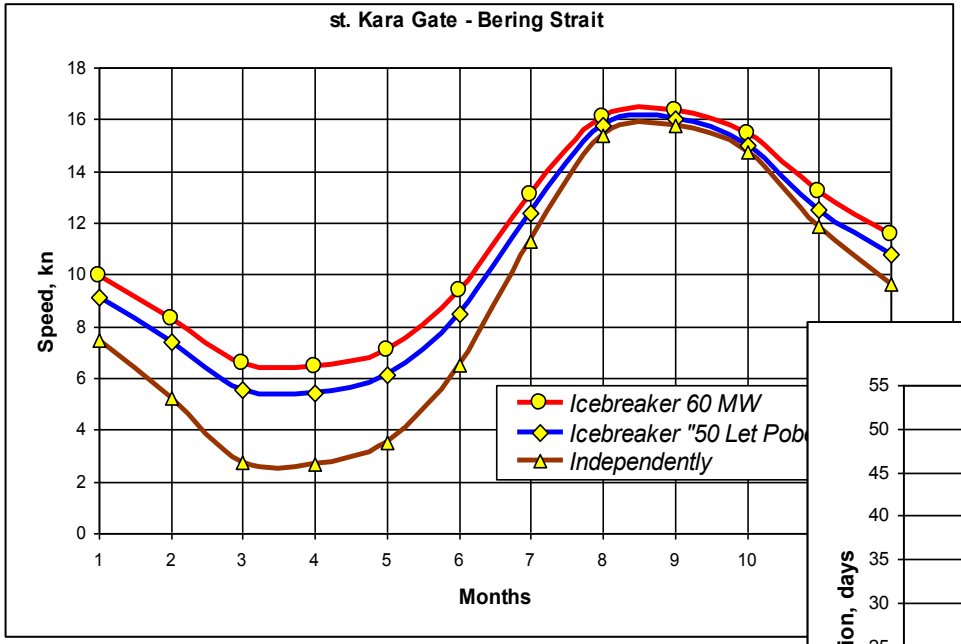
3 – in the western part of the Kara Sea,

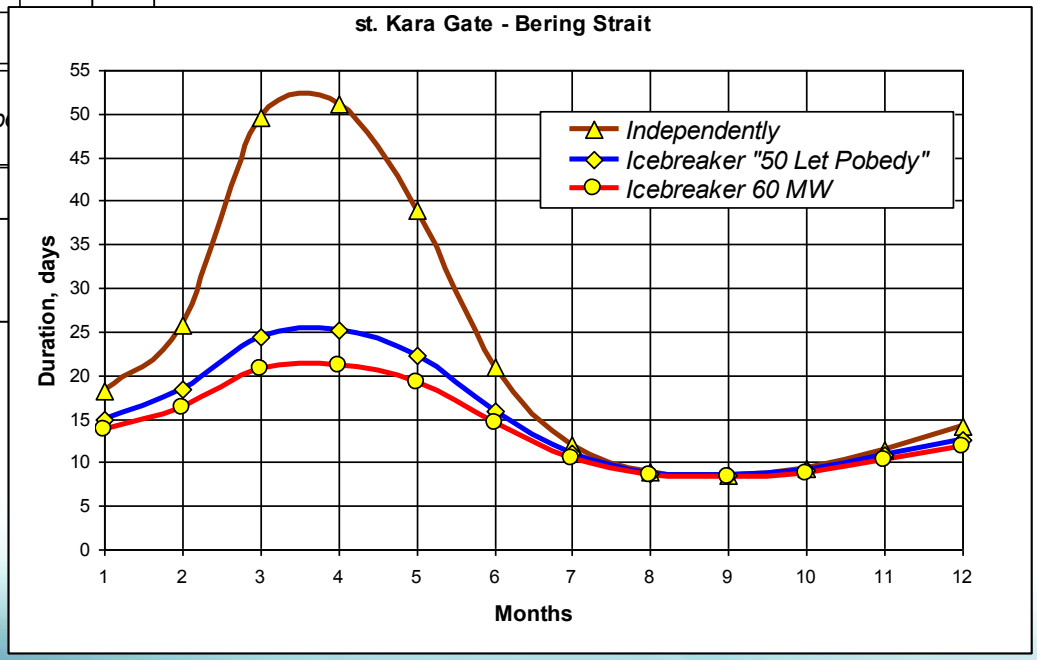
4 – in the south-eastern part of the Barents sea

Scheme of technical and economical calculations

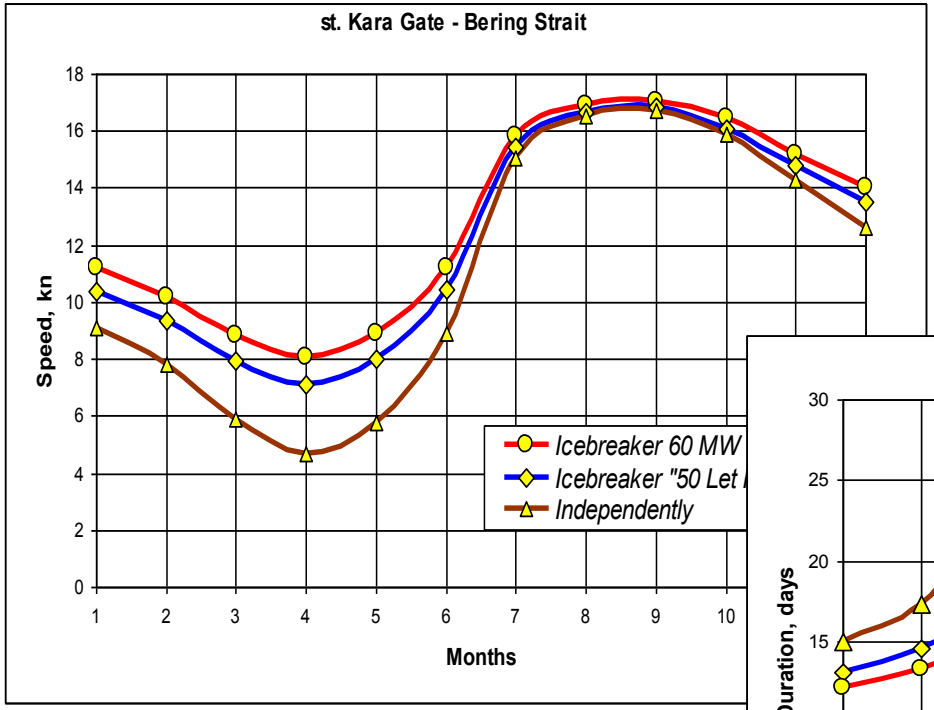


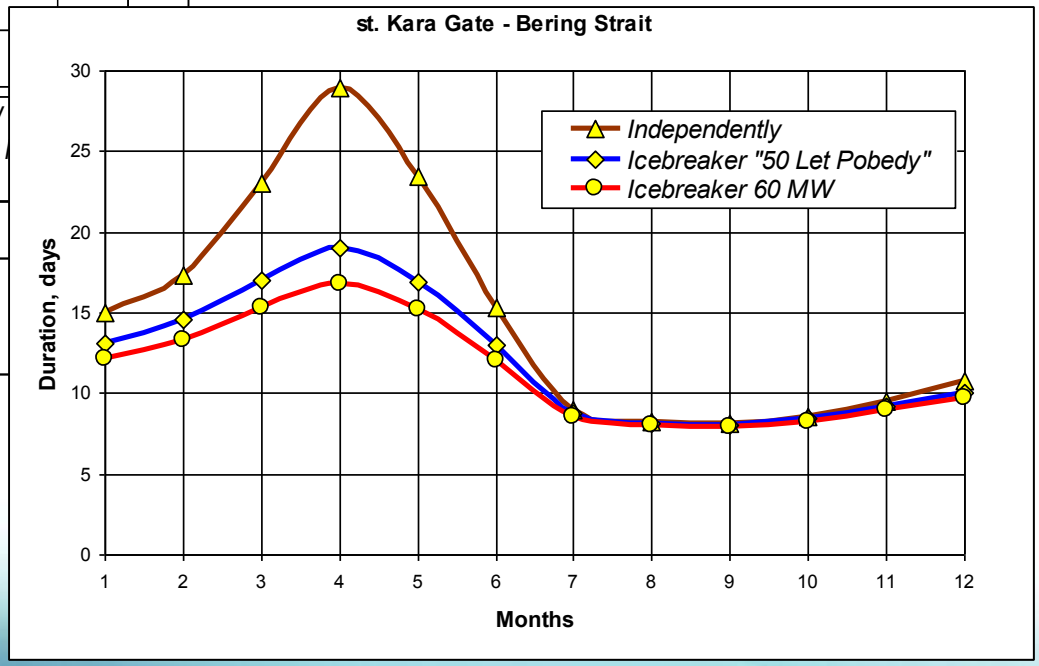
Speeds and duration of navigation of arctic container vessel independently and under nuclear icebreaker escort through the NSR under typical ice conditions



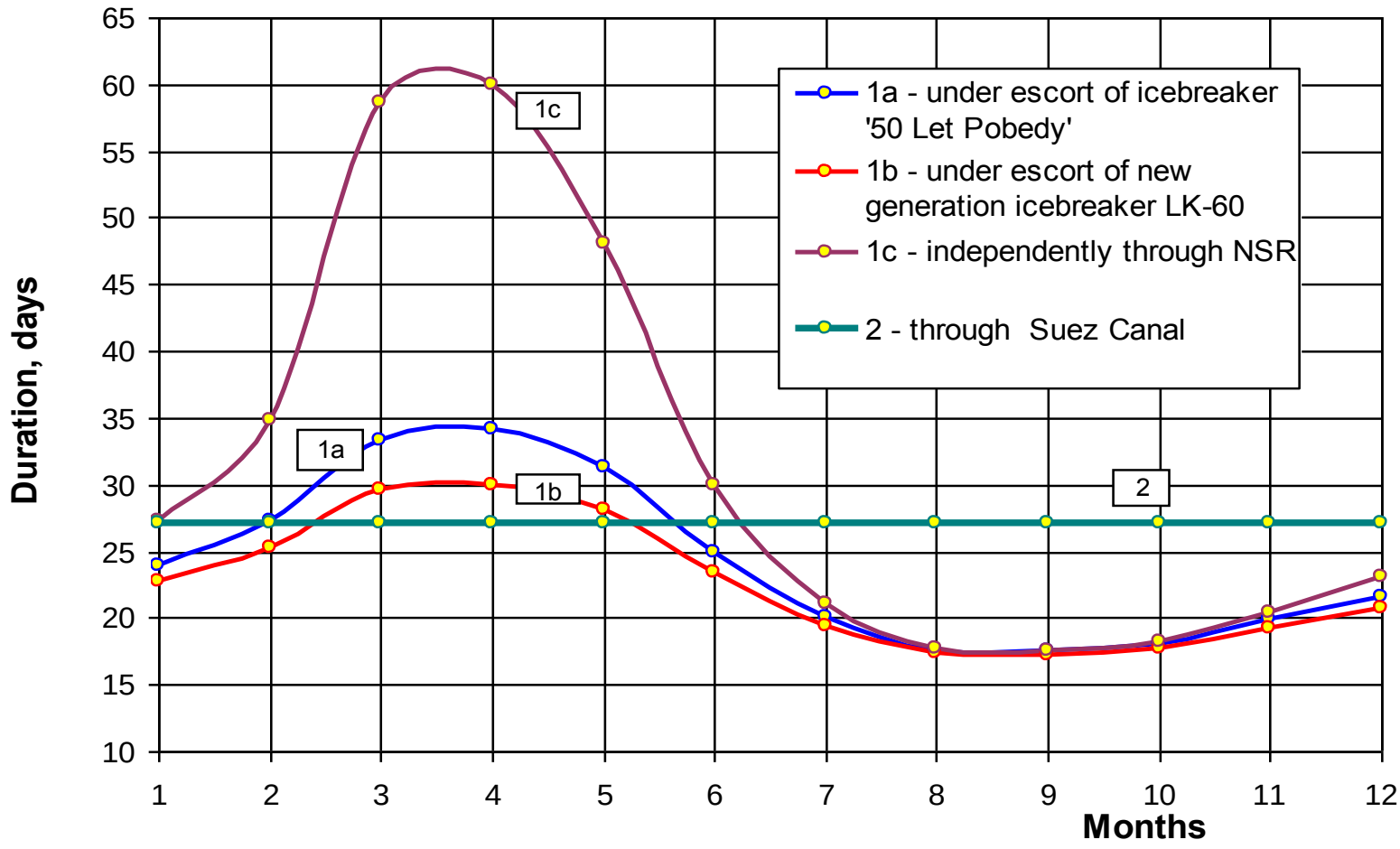


Speeds and duration of navigation of arctic container vessel independently and under nuclear icebreaker escort through the NSR taking into account predicted warming in the Arctic

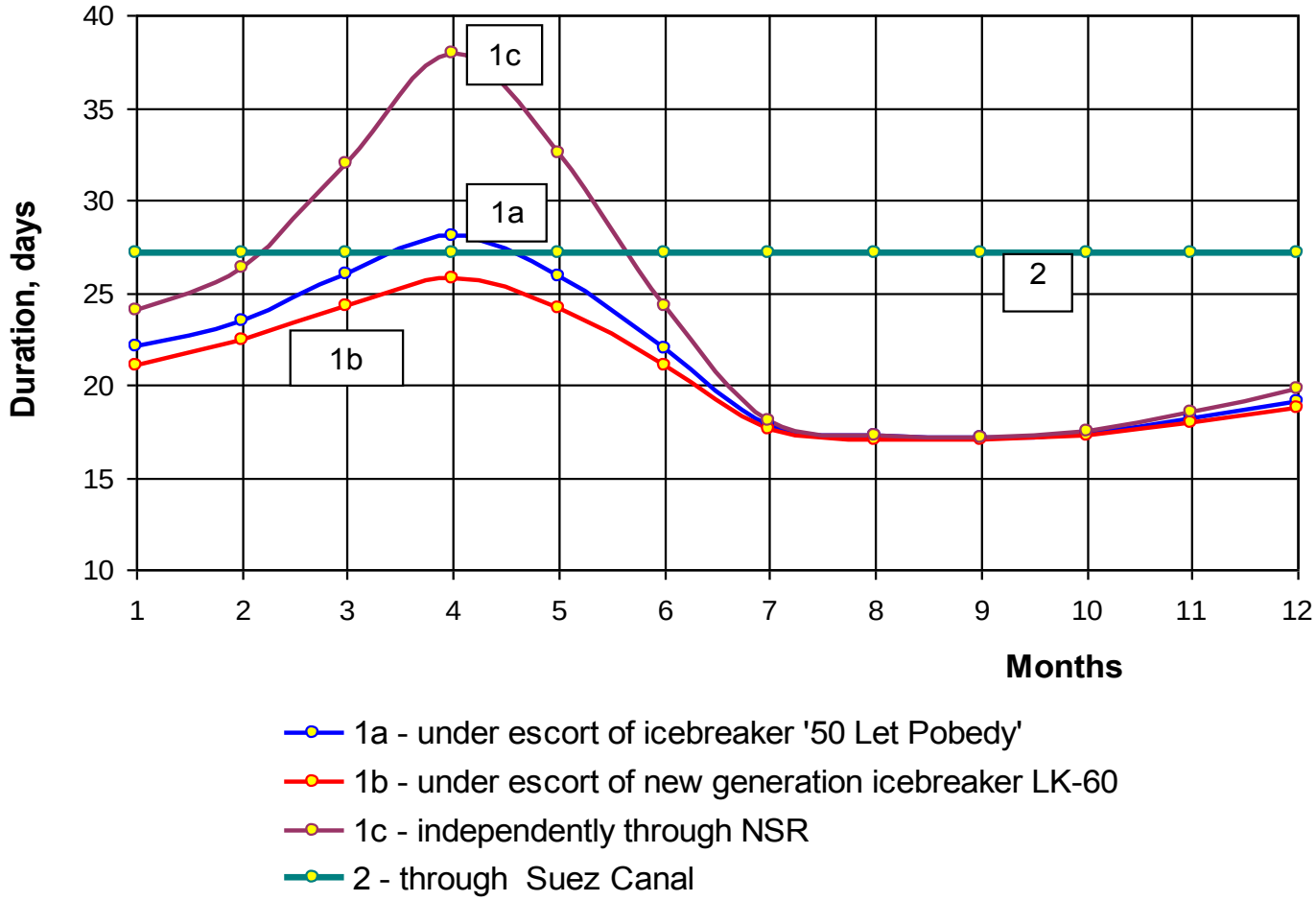




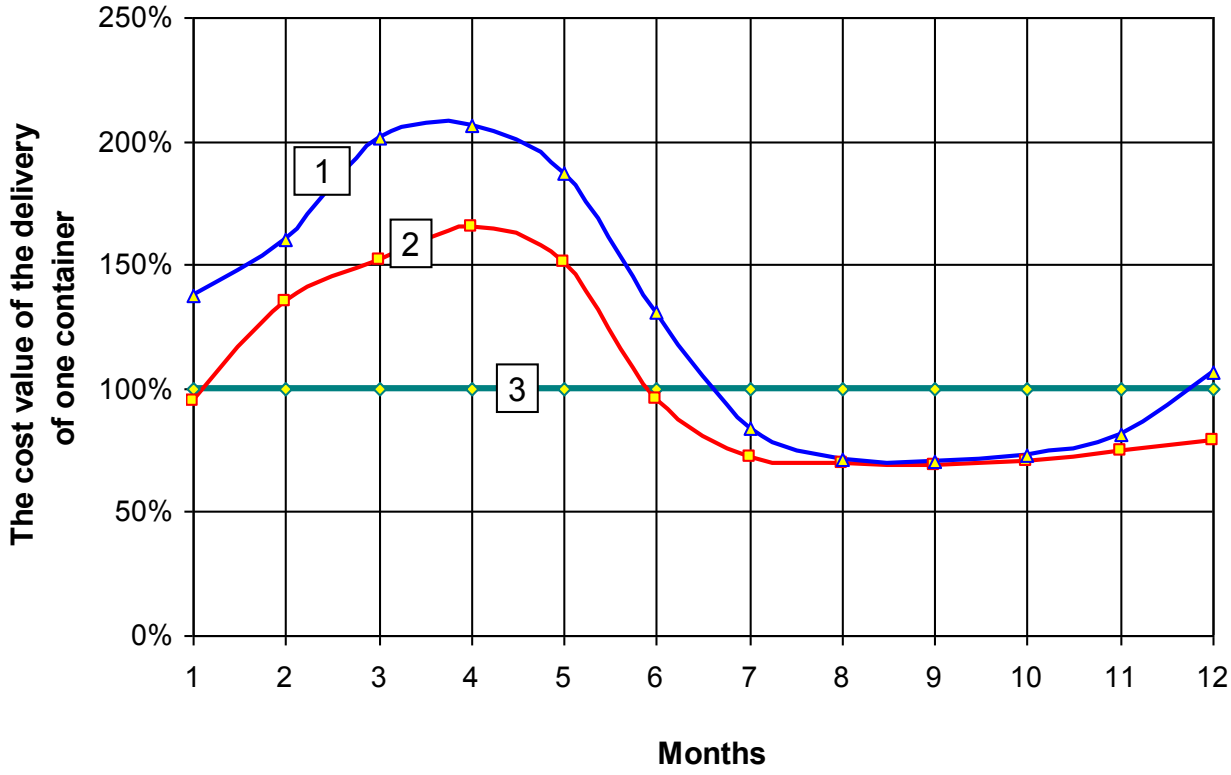
Duration of the voyage of 2500 TEU container vessel from Hamburg to Yokohama: 1 - through NSR (typical ice conditions); 2 - through Suez Canal



Duration of the voyage of 2500 TEU container vessel from Hamburg to Yokohama: 1 - through NSR (warming in the Arctic); 2 - through Suez Canal



Cost value of the transportatin of one container from Germany to Japan on the Southern way and via the Northern route using icebreaker «50 let Pobedy»



1. under average statistic ice conditions
2. under condition of the eventual warming
3. when navigating through the Suez canal

Comparison of the cost value of the delivery of one container in the direction from Yokohama to Hamburg on the Southern way and via the Northern route under the escort of icebreaker «50 let Pobedy» (on the average per year)

USD/TEU

Through the *Northern Sea Route*	*Under the icebreaker assistance*	*Independently*
➢ under average statistic ice conditions on seaways of the NSR	**115 %**	**-**
➢ taking into account the anticipated warming in the Arctic	**96 %**	**87 %**
Through the *Suez Canal*	**100 %**	

Thank you for your attention!