Engineering at BC Ferries - Maintaining and Expanding the Fleet

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BCFerries

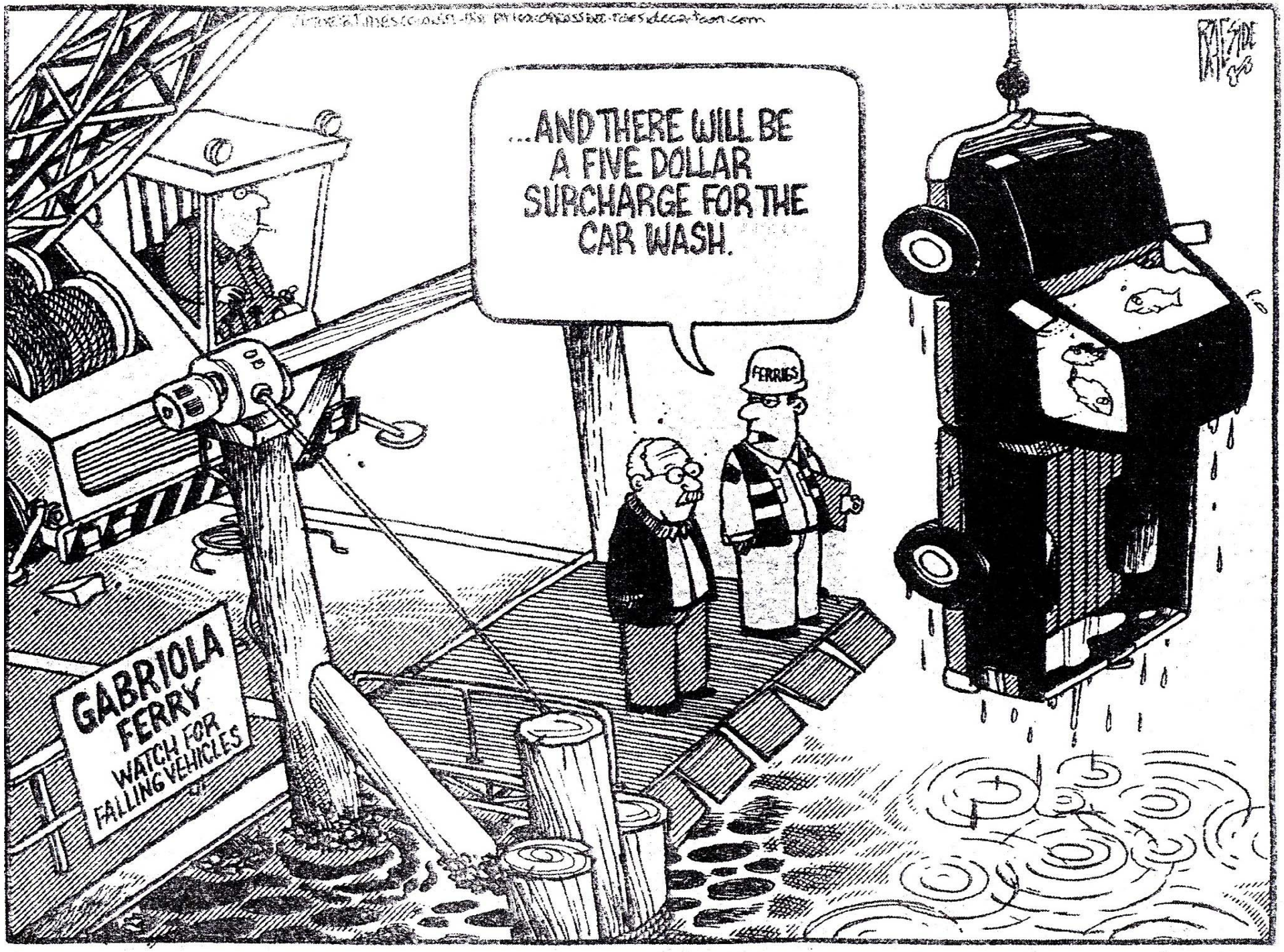
Topics

- Safety
- Vessel Upgrades
- New Construction and Conversion
- Northern Terminal Program
- Fuel Efficiency Program
- Other Interesting Stuff

BCF uses every available means to

understand our customers…

Perhaps the most insightful…



Our Service

- Diverse service
  - 25 routes, 36 ships, 47 terminals
- Last Year
  - 21.7m passengers
  - 8.5m vehicles
- Daily average
  - 58,000 passengers
  - 22,000 vehicles
- More than 500 sailings/day
- On-Time Performance: 86.5%
- Fleet Dispatch Reliability: 99.97%

Commitment to Safety

- Commitment to safety is uncompromising/non-negotiable
- Meet or exceed all Transport Canada requirements regarding vessel and crew regulations, including training
- Comply with the requirements of the International Maritime Organization (IMO) and the International Safety Management (ISM) Code
- BC Ferries has voluntarily adopted and implemented a Safety Management System (SMS)
  - External audits by LR
  - Internal audit process

Safety Training

- Safety training and emergency response management are essential to our daily operations
- 9,720 days of safety and operational training last year
  - Targeting 13,000 plus days next year
- $4.0 million spent on safety training this year
  - $5.3 million next year
- Conducting a review of our new hire training programs
- In the planning stage for a Training Academy

Engineering Safety Initiatives

- Incident Command System (ICS) for all Engineering managers
- Standing "Engineering Major Incident Team" for investigations
- Embedded investigation tools:
  - Structured investigation methods
  - Root cause analysis
  - Failure mode, effect and criticality analysis (FMECA)
- Engine Room Resource Management (ERM)
- Environmental Response Experience
- Communication
- Training and Culture - *"Raising the bar"*

BCF Engineering

- BCF Engineering is a substantial contributor to BC marine and construction industries
- More than 720 Engineering staff employed:
  - 400 Marine Engineers & 130 ERAs in the fleet
  - 50 Engineering mgt and 140 trades technicians ashore
- 165 ship repair specialists at Deas Pacific Marine
- BCF Engineering annually procures (ex. labour):
  - $30m/year of ship operational services
  - $100m/year of ship refits and modification services
  - $17m/year of Terminal Maintenance services
  - $55m/year of Terminal Construction services

Ca. $200m / year of local marine spending

Vessel Upgrades

- *Nanaimo* life extension and safety (05)
- 2 x S class pax accom (05, 06)
- 2 x S class ME emission upgrades (06, 07)
- *Kwuna* mid-life (05)
- *Burnaby* pax & machinery project (07)
- 4 x C Class MLU (03-06)
- *Alberni* MLU (5th of 5) (07)
- *Capilano* new propulsion system (07)
- *Quinitsa* midlife & re-power (07)
- *Quinsam* midlife and prop sys (08)
- *New Westminster* Upgrade (08)

Over $325m of safety, hull, machinery & pax investment in 14 vessels

Another $60-70m/year in refit and maintenance spend.

Vessel Construction

Current Construction:

- *Northern Adventure* (buy/convert) 100 AEQ (07)
- *Kuper*, 32 AEQ (06)
- IM Ferry, 125 AEQ (08)
- Northern Vessel, 130 AEQ (09)
- Super C, 3 x 370 AEQ (07/8)

7 Vessels

$ 850m+ committed investment in fleet assets

In Planning:

- Northern Vsl 60 AEQ (2010) (possible used vsl)
- Minor & IM vessel program (12 x) (2010-15)

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New Vessels
Major Project Timeline

2006 2007 2008 2009 2010 2011

Kuper

Intermediate

Coastal Renaissance

Coastal Inspiration

Coastal Celebration

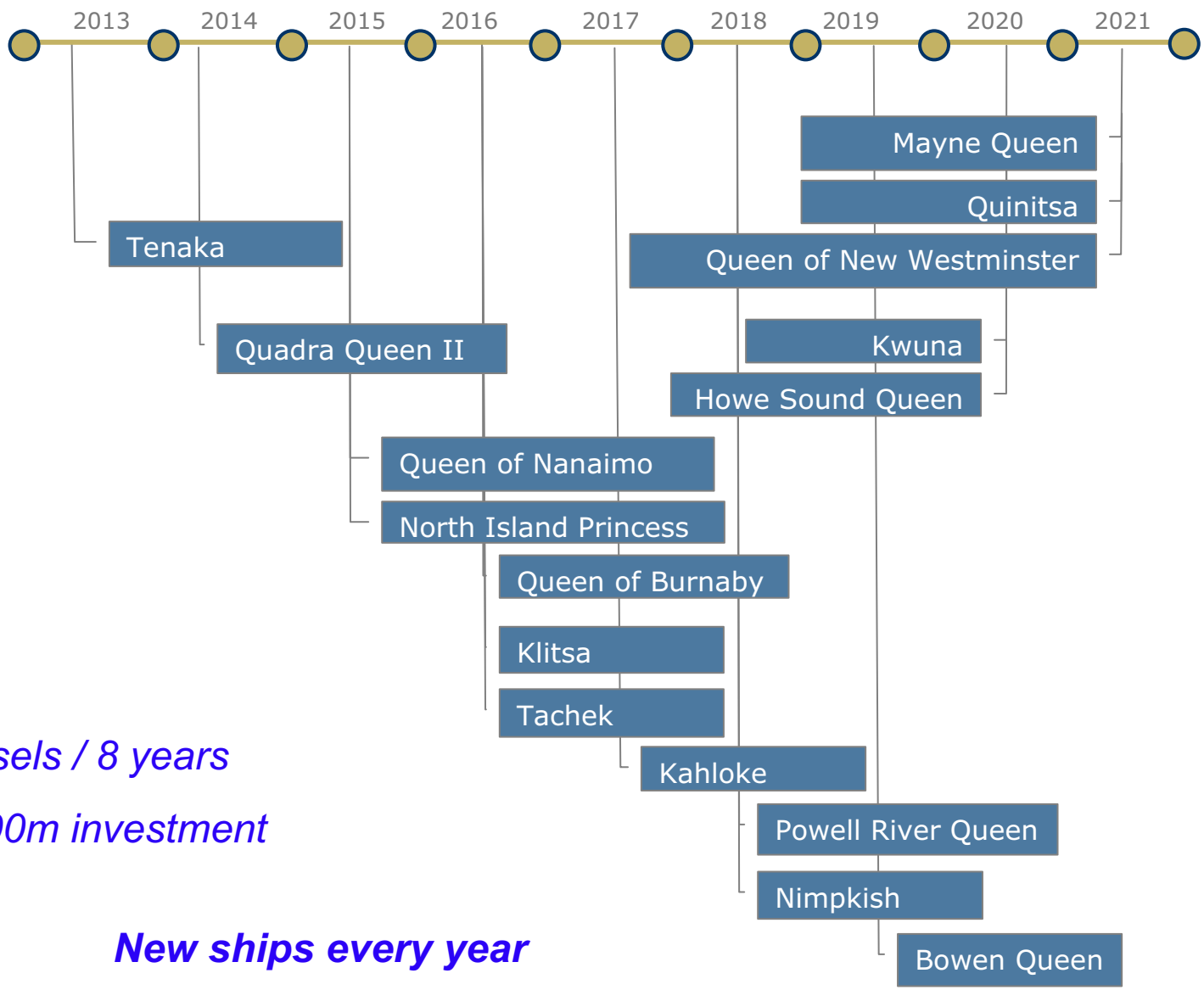
2007-8 will be a challenging fleet integration period

Northern Adventure

Northern Expedition

Northern Discovery

New Vessels



16 vessels / 8 years

ca. $600m investment

New ships every year

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Kuper

- 32 AEQ; 300 pax
- 2 x DDA Series 60, 355kW @ 1800 rpm
- 2 x HRP 4111 azimuthing thrusters

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Kuper

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Kuper

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IM Ferry

- 125 AEQ, 600 pax
- 4 x Niigata 6L25HX; 1140 kW @ 750 RPM
- 4 x Niigata ZP-21 azimuthing thrusters
- 14.5 kts; 12 minute turnaround

Super C Class

- 370 AEQ; 2020 lane m
- 1500 Passengers
- 21 knots
- 160 x 28 x 8.5 m
- ABS Class; Transport Canada

- Inter-operable with all Mainland Terminals
- 2 Car Decks, single casing, *no ramps*

- 2 Passenger Decks
- 3 Vertical Zones arranged for shut-down
- Scope for expansion

Super C-Class

- 4 x MaK 8M32C
- Diesel-Electric
- Full feather CPP, constant speed
- High lift rudders

- Double-Ended based on C-class Configuration
- Ease of transit/access

Super C-class Propulsion

- Main Engines
  - 4 x MaK 8M32C; 3.8mW @ 600 RPM; total 15.2 mW
  - Fuel efficient; SFOC 178 g/kW/hr; 55 tonnes/day
  - 4 x SAM alternators, 6000 v, 60 hz.
- Propulsion Motors
  - 2 x SAM 11.6 mW, 6000 v @ 60 hz, 717 RPM
- Propellers
  - 2 x Schottel CPP, 11 mW, 5m dia @ 127 RPM, Ice Class 1A
- Reduction Gear
  - Flender, single in, single out; No long shaft lines or complex gearboxes
- Comments
  - 21 kts @ 85% MCR (3 engines) or 18 kts @ 85% MCR (2 engines)
  - Power to maintain speed in adverse conditions
  - Redundancy; service equipment on the run

Super C Timelines

- Contract — Sept 2004
- First Steel – Vsl 1 — Aug 2006
- Keel laying – Vsl 1 — Jan 2007
- Launch – Vsl 1 — April 2007
- Delivery to B.C. — October 2007
- Entry into Service
  - – Coastal Renaissance — late 2007
  - – Coastal Inspiration — early 2008
  - – Coastal Celebration — mid 2008

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Northern Adventure

Northern Adventure Particulars

LOA: 117 m Bmax: 20 m	Draught: 4.7 m
Full load disp. @ draft 4.7m:	approx 5900 t
Pax Accommodation	70 x 4-bed cabins; 4 suites
Vehicle/Pax capacity:	101 AEQ / 600 passengers
Service speed:	20 knots
Classification society:	Lloyd's / RNA
Propulsion:	2 x MaK 16VM32C, 8000 kW @ 750 rpm 2 x Flender reduction gears w/ PTO 2 x 3500 mm RR Kamewa CPP
Auxiliary mach:	3 x Cat 3508 gensets, 800 kW ea 2 x 800 kW shaft generators 2 x bow thrusters, 400/370 kW
Year Built:	2004

Northern Adventure Conversion

- Stern door modification (2 ramps >1 Ramp); MacGregor design/supply package
- Phase 1 docking fairings added ("dovetails")
- Main engine service (MaK train crew); Convert to MDO
- Overhaul and certify sewage treatment plant.
- Electrical: Fit 60 Hz electrical system; + 60>50 hz shore converter
- Totally new galley and restaurant areas on deck 5
- Service all life saving and emergency equipment
- Add new impressed current system and rubbing strake
- Light ship survey, inclining, new stability book; Update all drawings

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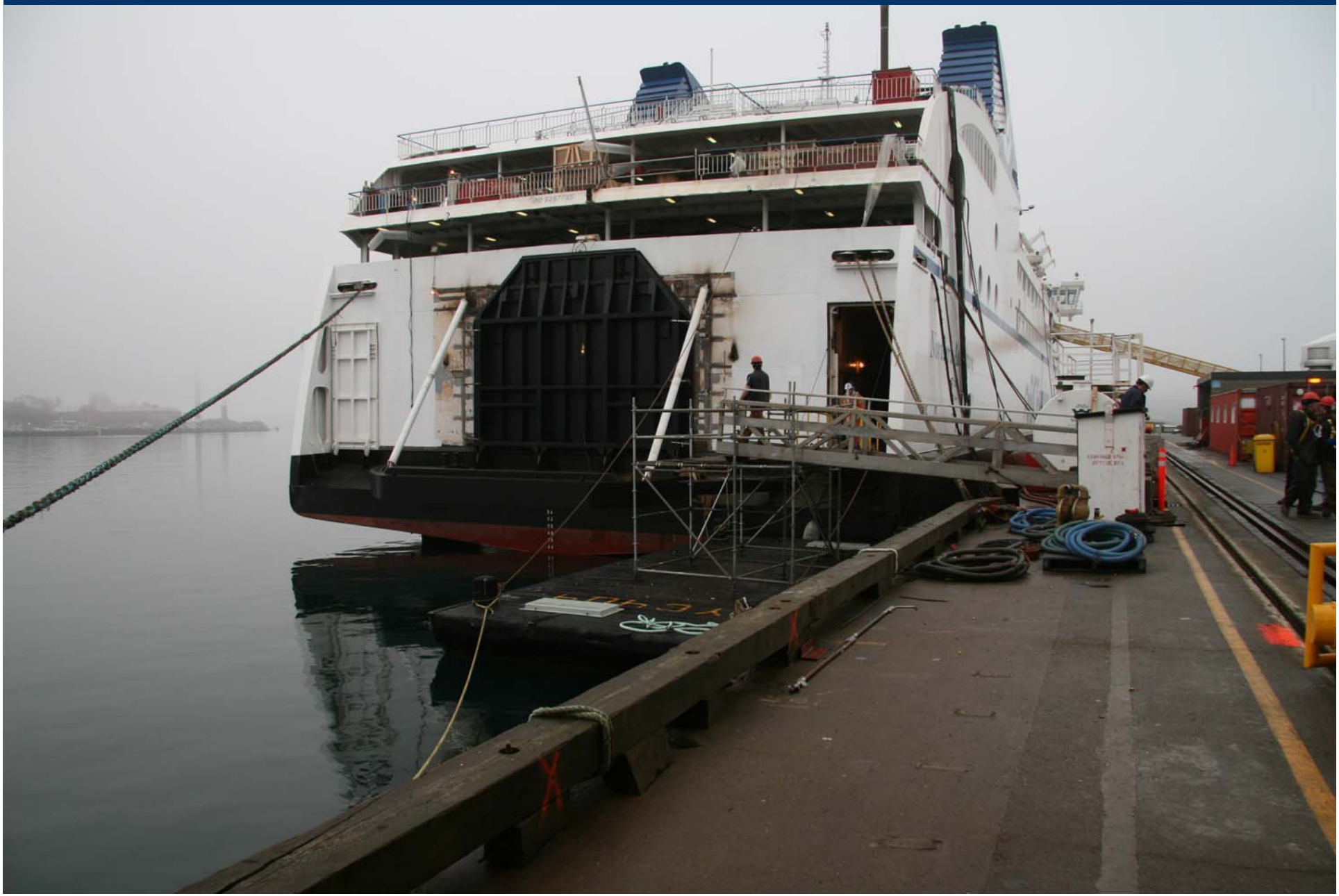

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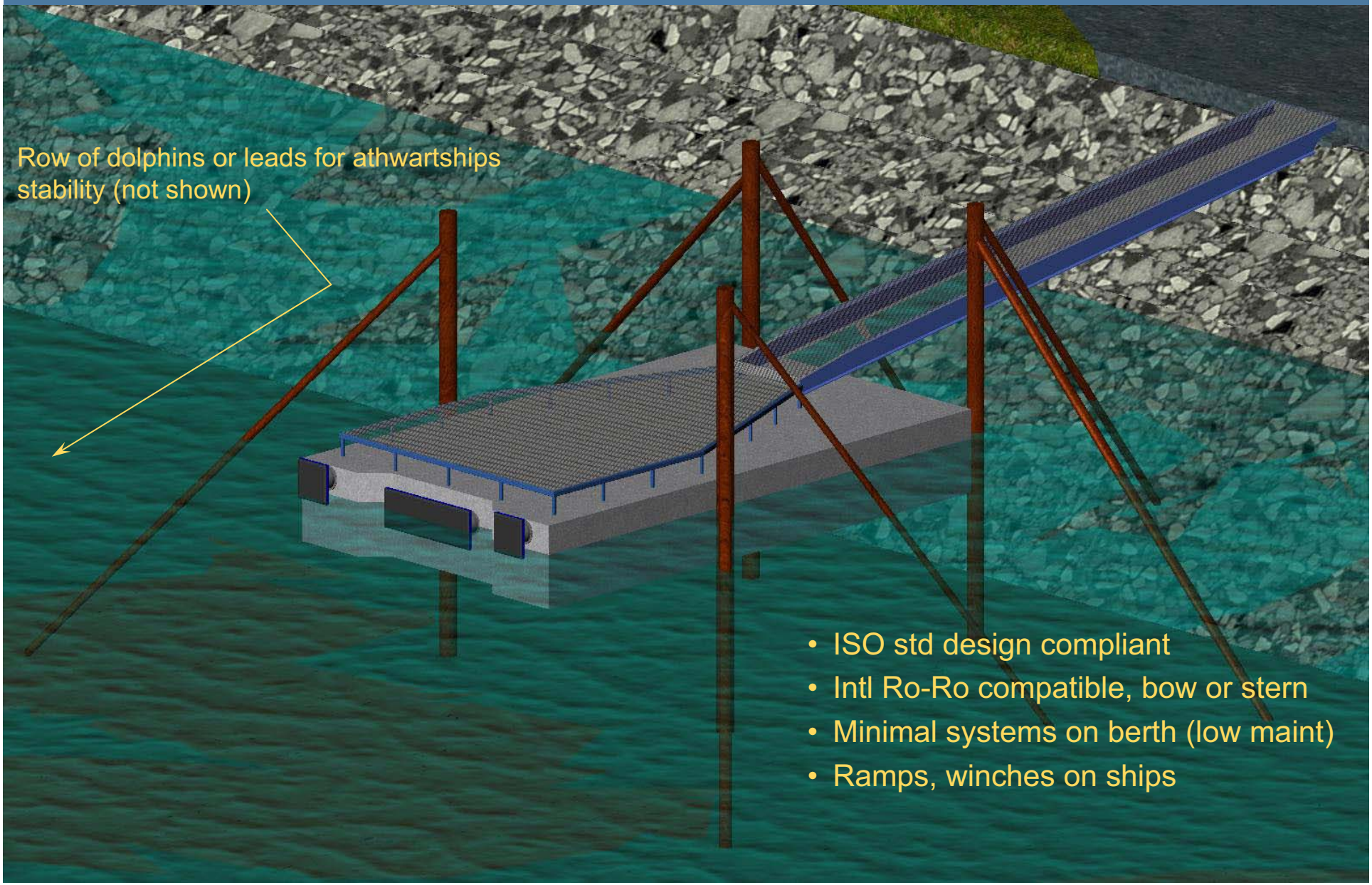
Northern Expedition

- 150 m x 24 m x 5 m (l x b x d)
- 130 AEQ, 600 pax, 55 x 2 berth cabins
- 2 x MaK 9M32C, 4500kW ea. @ 600 rpm
- 2 x bow thrusters, 1 x stern thruster, 2 x shaft alternators
- 21 kts @ 85% mcr

Northern Berth Redesign Project

- 5 terminals to be converted to completely new standard
  - Change from traditional "curved" structures to "square" style (ISO RO-RO std)
  - Floating pontoon structures, minimal systems
- Tight time frame in 2 phases
  - Phase 1: 2007 *Northern Adventure* + *QPR* interoperable
    - *Adventure* w/ temporary fairings to emulate curved stern
  - Phase 2: 2009 *Northern Adventure* + *Expedition* interoperable
    - Remove *Adventure* temporary fairings, full square stern design

Northern Berth Project



- ISO std design compliant
- Intl Ro-Ro compatible, bow or stern
- Minimal systems on berth (low maint)
- Ramps, winches on ships

Fuel Efficiency Program

- Hull resurfacing
- CPP Re-Blading Investigation
- ESP 1000 Fuel Pilot
- S class bulbous bow and blade investigation
- Re-power: New engines in K & Q class, NIP and Mill Bay
- Investigating additives, appendages, etc.

Results are encouraging

Other Interesting Stuff

- Fleet wide Sewage Treatment Program (12 new, 12 upgrade)
- Fleet wide Voyage Data Recorder (VDR) Program (33 vsls)
- "New Generation" standard berth design
  - Square & curved configuration for southern terminals
- HSB & Departure Bay marine structure upgrading
- HSB transfer deck replacement
- Departure Bay Terminal redevelopment ($40m +)
- Swartz Bay Master Plan ($60m +)
- TSW Berth 4 Replacement Project
- Automotive Fleet rationalization

Summary

- BCF Engineering has multiple initiatives underway intended to advance the material condition of its fleet and shore assets.
- We are focussing on the practise and performance of marine engineering at BCF
- Major work is underway in the areas of:
  - Safety
  - Vessel Construction and Upgrades
  - Terminal Developments
  - Fuel Efficiency Program
  - Many other forward looking initiatives

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Questions