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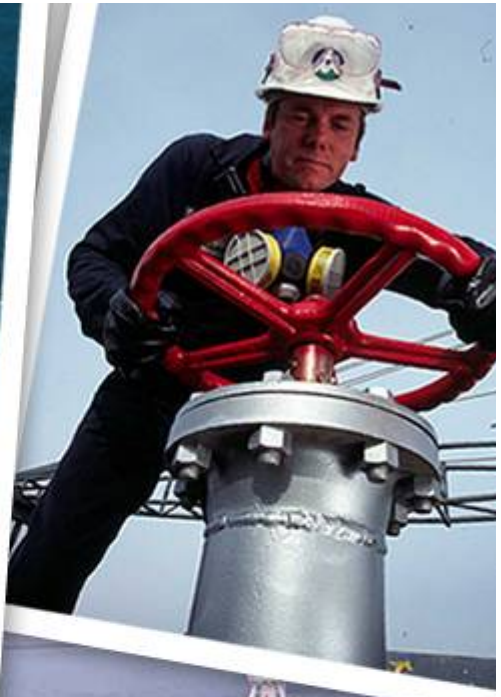

Modern ATB
The Jones Act Solution

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SNAME Maritime Technology Conference

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Elements of Transportation Cost

- Storage and Distribution
- Marine Transportation – Our focus
  - Operating Expenses – people, maintenance, insurance
  - Voyage Expenses – fuel, port costs
  - Capital Investment
  - Parcel Size
  - Transportation Distance
  - Speed

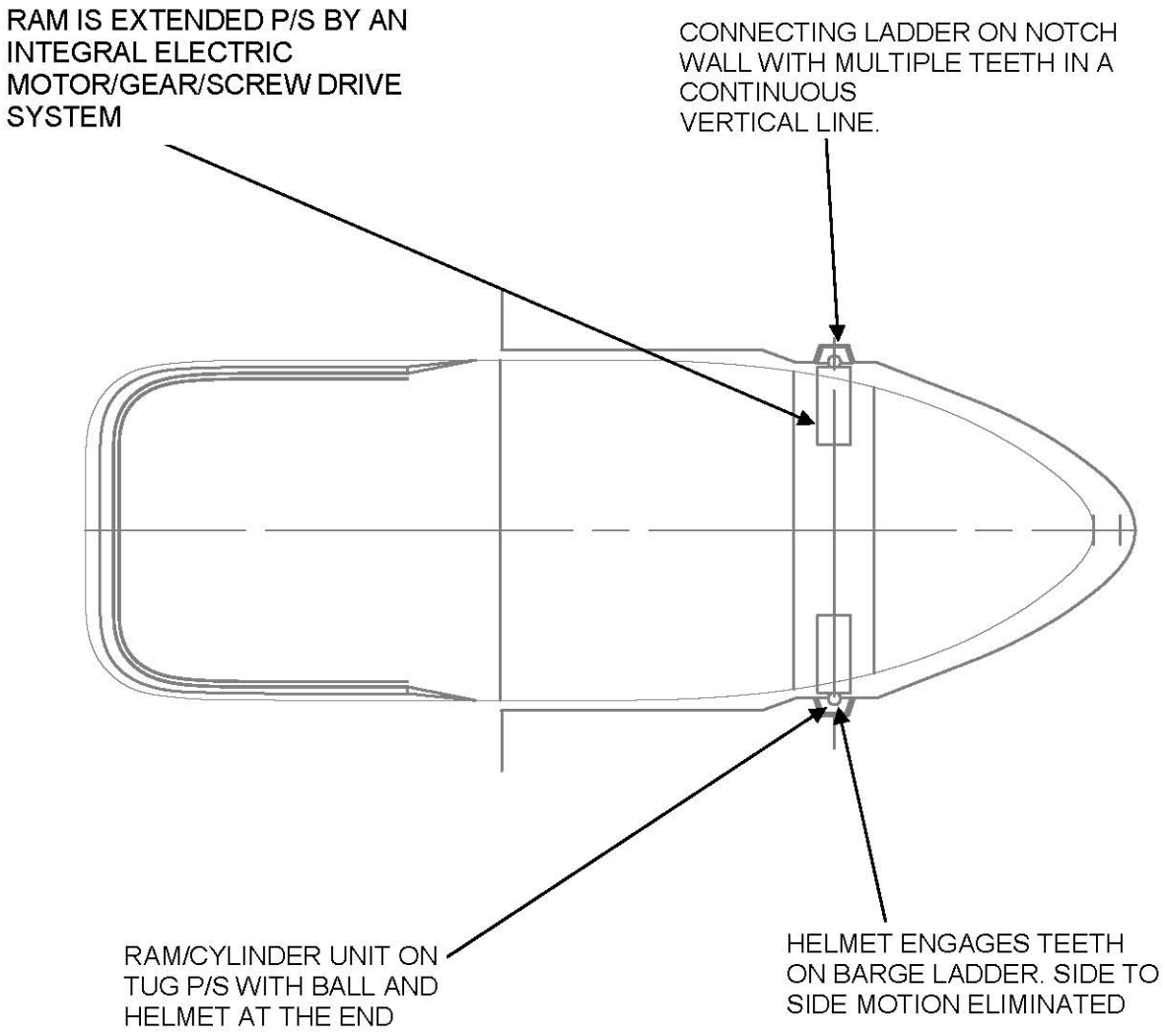
Tug-Barge Regulatory Environment

- USCG Navigation and Vessel Inspection Circular (NVIC) 2-81 – regulations pertaining to tug-barge combinations
- Push Mode Integrated Tug Barge (ITB)
  - Tug and Barge cannot operate separately
  - Treated like a ship by USCG
- Dual Mode Integrated Tug Barge (ATB)
  - Tug and Barge can separate and operate safely on tow line
  - Treated as two vessels by USCG
  - Industry has adopted the term Articulated Tug Barge (ATB) for the dual mode ITB

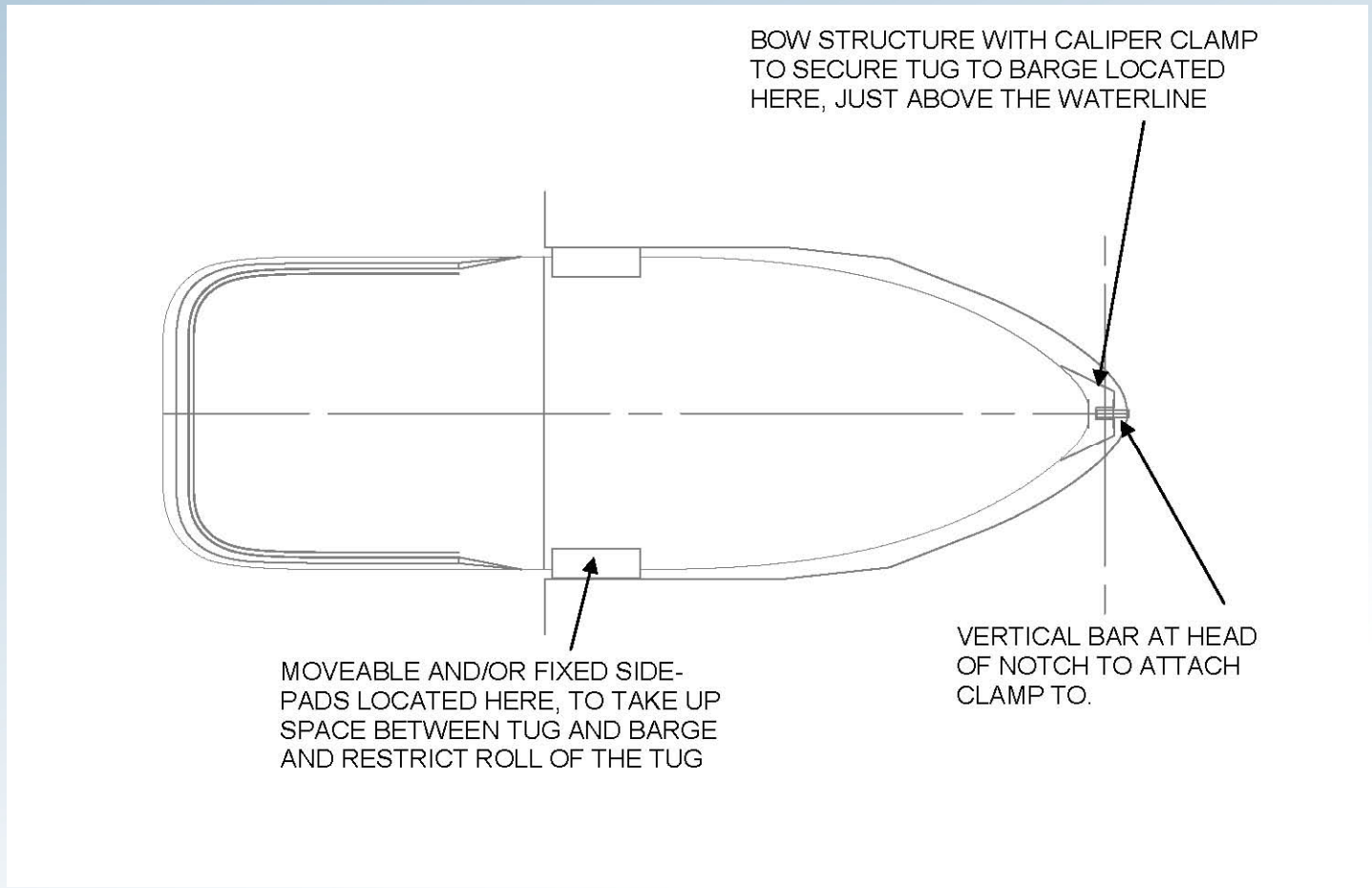
Connection Systems for ATB

- Pin Type Systems
  - Pins on Tug extend into ladder in barge notch
  - Pins allow tug to pitch relative to barge but otherwise tug moves with barge
  - Includes Intercon
- Bludworth-Cook Marine System
  - Hydraulic caliper at tug bow
  - Vertical bar at apex of barge notch
  - Pads on boat sides position vessel in deep notch

Intercon Coupler



Bludworth-Cook Marine Coupler



Self Propelled Tanker

- Complement - 21
- IFO-380
- 15 Knots
- Slow Speed Diesel
- Single Screw
- 330,000 bbls

Traditional ATB

- Complement – 9
- Diesel Fuel
- 11 Knots
- Medium Speed Main Engine
- Twin Screw
- 240,000 bbls
- Intercon Coupler

Next Generation ATB

- Complement – 12
- IFO-380
- 13 Knots
- Medium Speed Main Engines
- Twin Screw
- 330,000 bbls
- Intercon Coupler

Vessel Comparison

	DH Conv.	Modern ATB	Tanker
Price	$42.5M	$77.5M	$90M
Main Engine	EMD 710-16	9L32/40	6S50MC-C
Power	8,000 HP	12,000 HP	12,900 HP
Speed	11 knots	13 knots	15 knots
Fuel Con.	26 mt/day	34 mt/day	35 mt/day
Complement	9	12	21
Economic Life	20 yrs	25 yrs	25 yrs

Vessel Comparison

	DH Conv.	Modern ATB	Tanker
LOA – Barge	546’/166m	570’/174m	-
LOA – Boat	137’/42m	154’/47m	-
LOA – Unit	627’/191m	670’/204m	600’/183m
DWT	30 kmt	46 kmt	46 kmt
Cubic Capacity	240 kb	330 kb	330 kb
Draft Full Load 8.3 bbls/mt	32’/9.8m	33’/10m	36’/11m
Load Line	33’/10m	40’/12.2m	40’/12.2m

Benefits of the ATB

- Lower operating expenses
- Lower capital investment
- At similar drafts, barge capacity larger due to absence of engine room
- Articulated tug/barge connection keeps tug in notch in up to 25 foot seas virtually eliminating weather advantage of the tanker
- Tug (living spaces) can separate from barge in an emergency

ATB Benefits –
Lower Operating Expenses

- ATB has smaller crew complement
- ATB vessels can be maintained separately
- Daily Operating Expenses:
  - Traditional ATB ~ $9,000/day
  - Modern ATB ~ $12,000/day
  - Tanker ~ $18,000/day

ATB Benefits – Lower Capital Investment

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- Barge design allows lower cost construction
- Smaller accommodation spaces
- Fewer systems
- Broadens market to mid-tier shipyards
- Building tug and barge separately allows efficient utilization of facilities
- Lower construction execution risk
- Competitive price with fewer vessels in series

ATB Benefits – Capacity When Draft Limited

SW Draft (cargo density 8.3 bbls/mt)	Traditional ATB	Modern ATB	Tanker
32'/9.8m	240 kb	325 kb	275 kb
34'/10.4m	-	330 kb	299 kb
36'/11.0m	-	-	324 kb

- Competitive advantage for draft constrained ports
- Tampa – Many berths have 32' to 34' restrictions
- New York – Many Arthur Kill berths limited to 33' brackish

Disadvantages of Traditional ATB

- Separate tug and barge results in less efficient hull form
- Traditional tug boats burn light fuel
- Traditional coupler doesn't allow changing barge drafts while tug and barge are connected

Modern ATB Design Addresses Disadvantages

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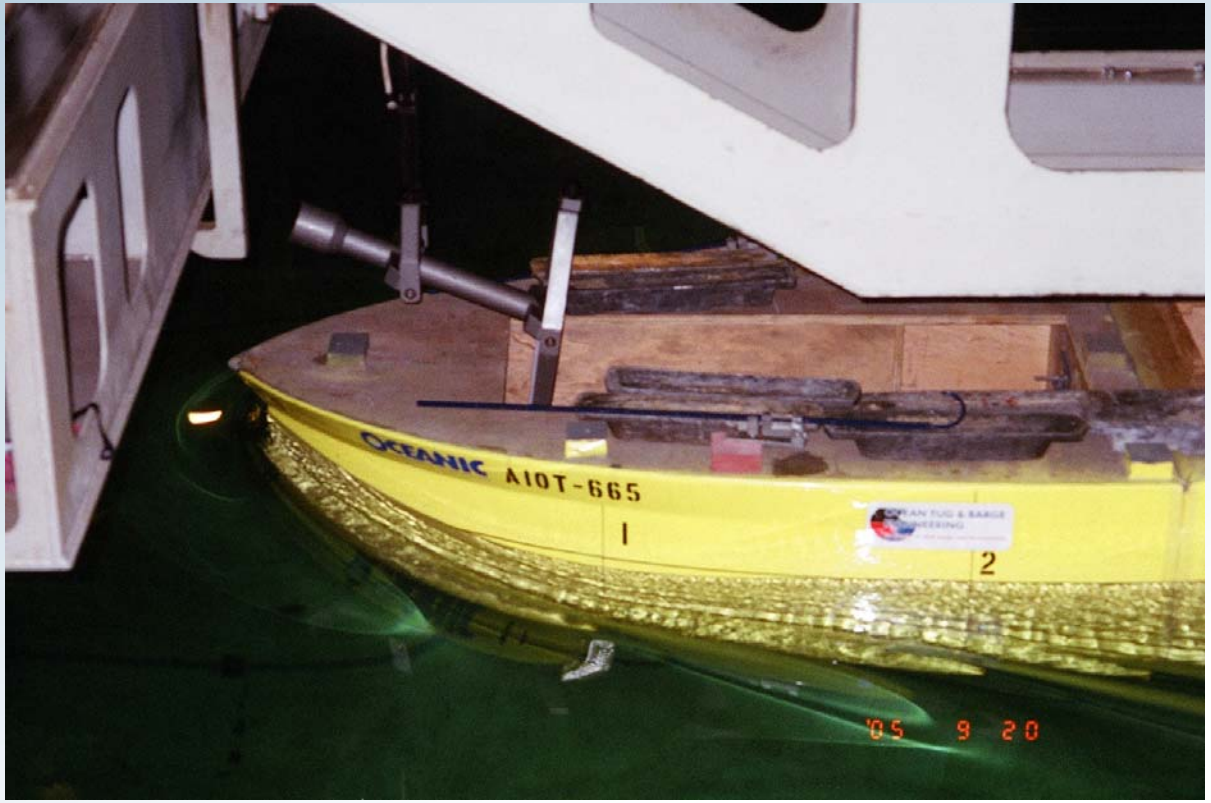
- Refined boat and hull forms using extensive model testing and computational fluid dynamics techniques
- Higher power, heavy fuel medium speed engines
- Refined coupling system allows draft changes for operations at offshore moorings or in lightering
- Barge equipped with Inert Gas System
- Tug built to SOLAS

Tanker vs. Modern ATB - Speed

- Recent model testing predicts service speed of 13 knots for 12 khp boat
- Tug hull could accommodate up to 15 khp for predicted speeds approaching 14 knots

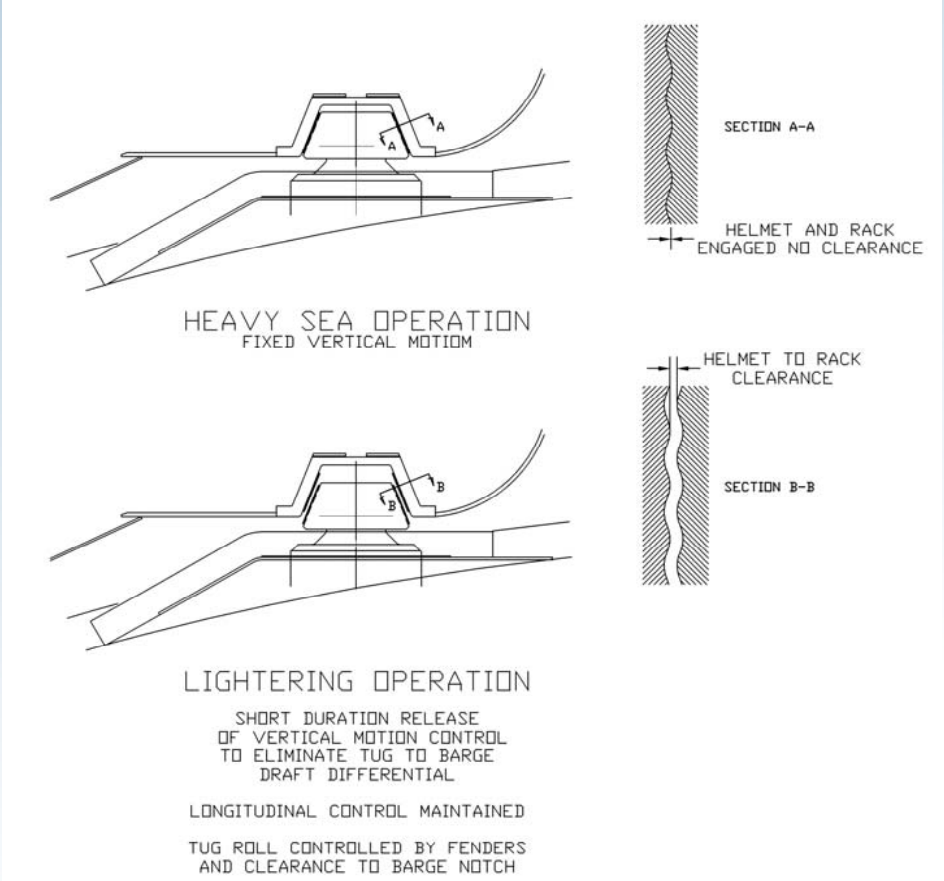


Tanker vs. Modern ATB - Fuel

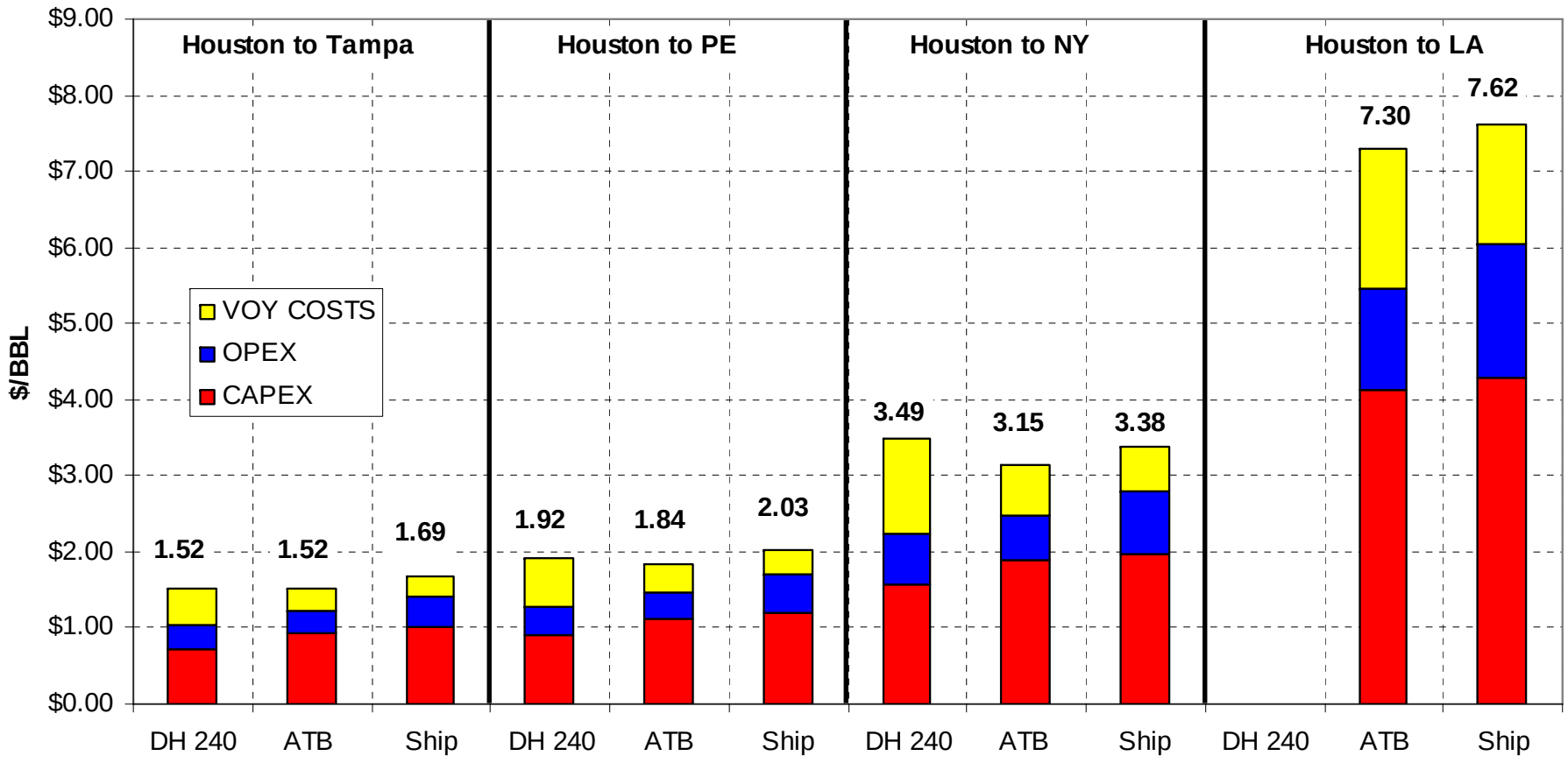
- Modern ATB design addresses many of the fuel advantages of tankers
- High efficiency (175 g/kw-hr) 4 stroke medium speed engines burn IFO-380
- Gensets burn diesel but shaft generators carry at sea loads

Tanker vs. Modern ATB - Seakeeping

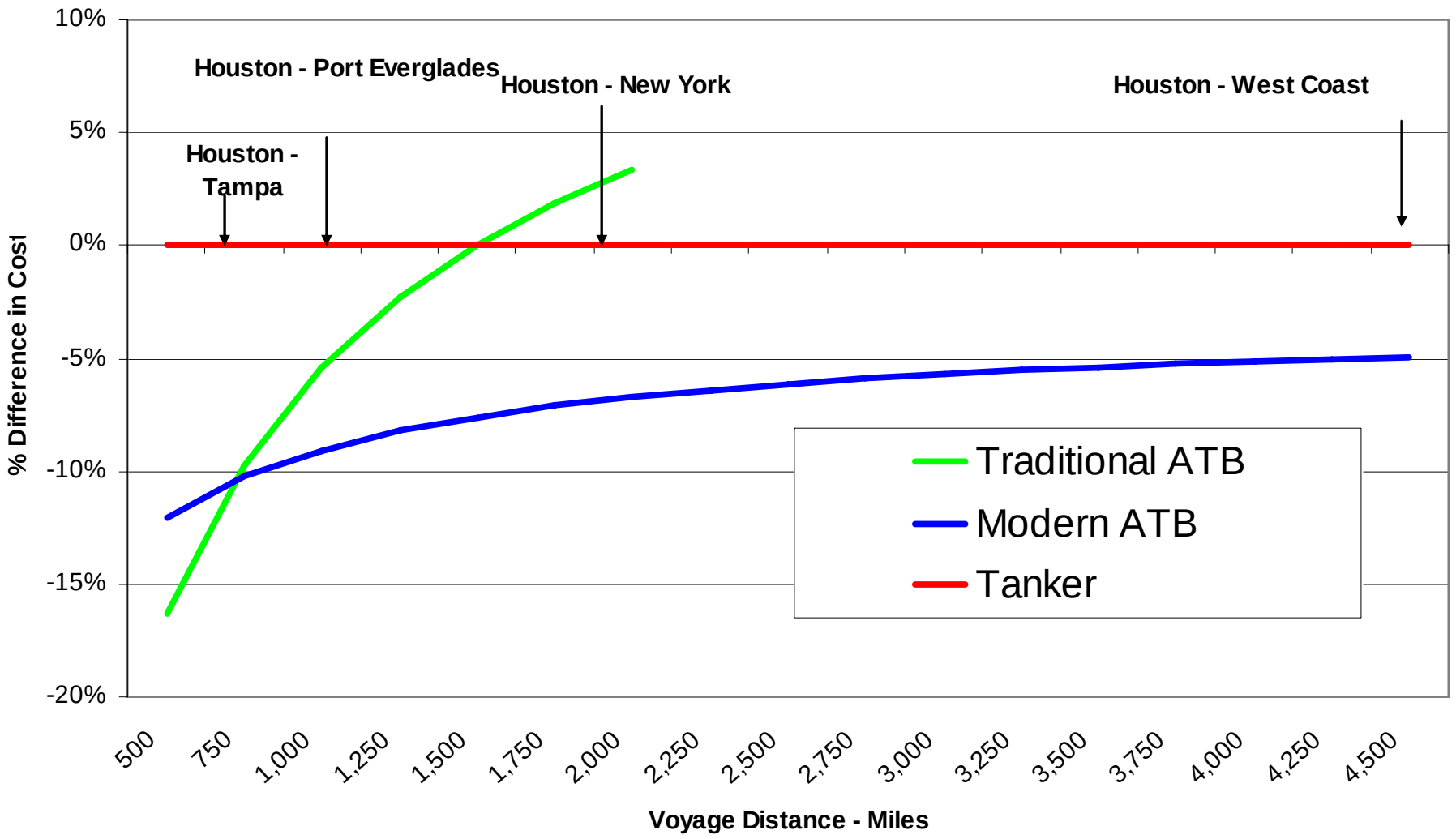
- Twin screw arrangement provides redundancy and improves maneuverability
- Intercon coupler provides at sea operating performance very similar to a tanker
- Smooth tooth waveform coupler allows tug and barge to stay coupled while barge changes draft allowing operations at offshore moorings



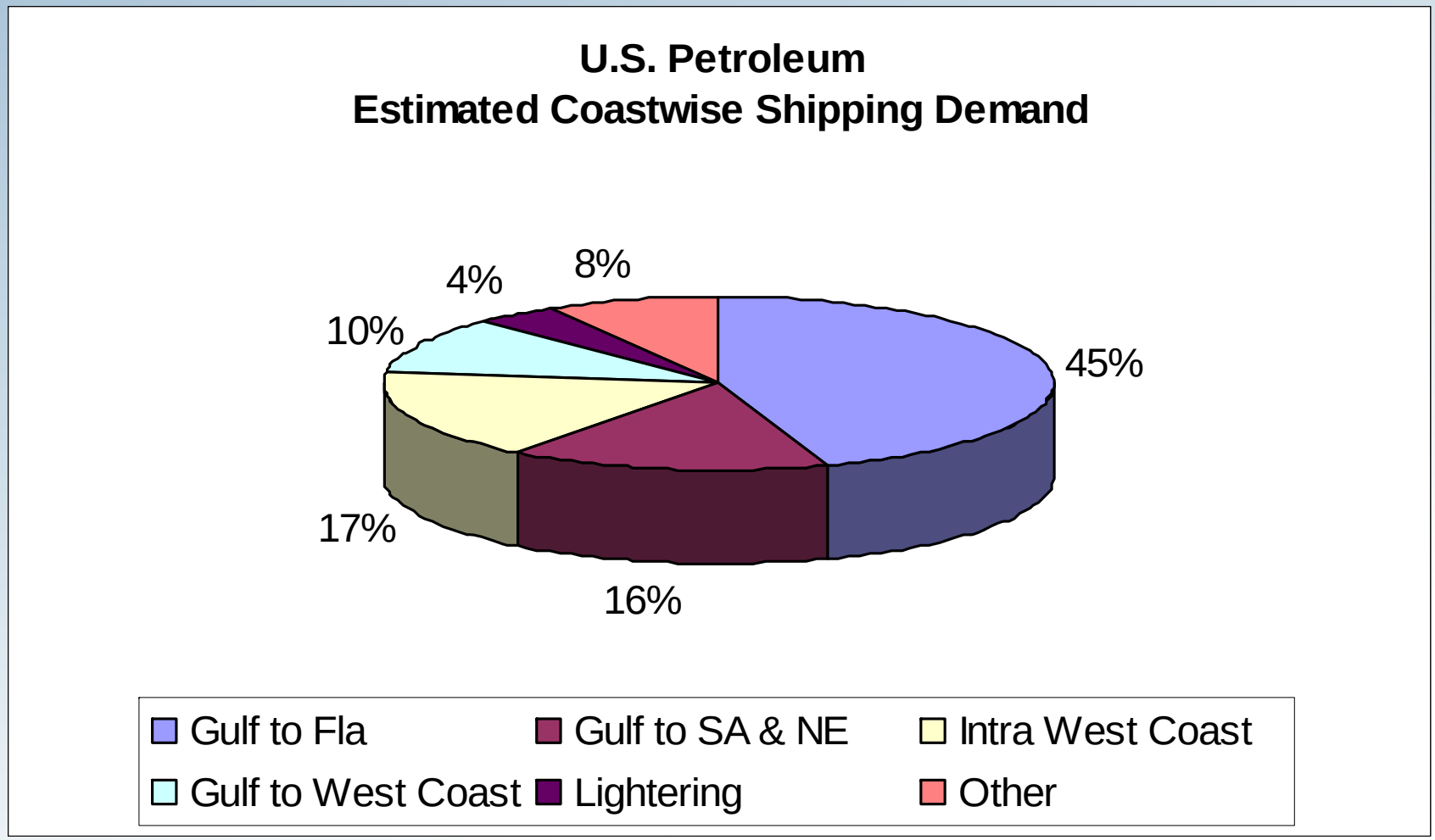
Delivered Cost Comparison



Delivered Cost Difference



Greatest ATB Advantage for Largest Market



Source: Wilson Gilette & Co US Coastwise Petroleum Study
10/21/05

Conclusions

- Traditional ATB more economical than tankers in the short trades
- Modern ATB more economical than tankers in all Jones Act trades
- Lower operating expenses and capital costs offset speed differential
- Modern ATB connection systems virtually eliminate weather advantage of tanker
- Shipyards can provide competitive pricing with fewer vessels in series

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