

ALASKA REGION RESEARCH VESSEL (ARRV)

Design Review Meeting February 2003



Alaska Region Research Vessel



Key Topics

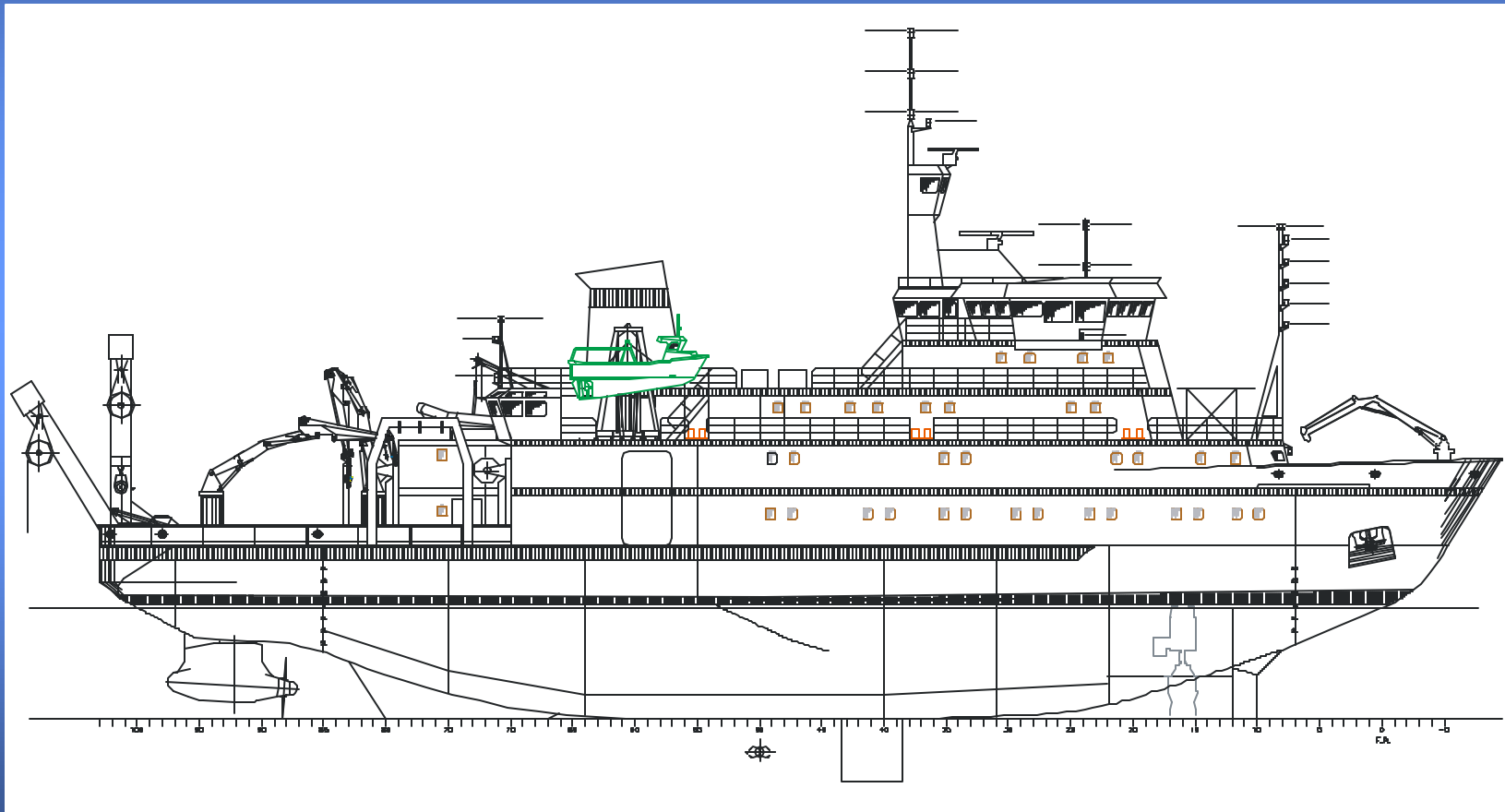
- Open Water Test Results
- Radiated Noise Test Results
- Balancing The Design
- Laboratory Arrangements
- Science Equipment Outfit
- Construction Cost Estimates
- Design Schedule
- Seward Facilities
- Community Outreach



Alaska Region Research Vessel



Outboard Profile



Particulars of Propulsion System Alternatives

| FACTOR | AZIPOD | ROLLS-ROYCE US355 Z-DRIVE AC | ROLLS-ROYCE US305 Z-DRIVE AC |
|---|--------|------------------------------------|------------------------------------|
| Rated Power – ABS A1 Ice Rated (KW) | 2150 | 2800 | 2145 |
| Required Power (KW) | 2150 | 2150 | 2150 |
| Margin on Required Power (%) | 0.0% | 23.2% | -0.2% |
| Propulsion Unit Weight (LT) | 102 | 106 | 57 |
| Buoyancy (LT) | 25.6 | 0 | 0 |
| Other Propulsion Drive Weights (LT) | 19.5 | 42.4 | 42.4 |
| Total Weight (LT) | 95.9 | 148.4 | 99.4 |
| Weight Increase (LT) | 0 | 52.5 | 3.5 |
| Net Buoyancy Per Lineal Foot Length (LT/FT) | 14.6 | 14.6 | 14.6 |
| Required Additional Length (FT) | 0 | 3.60 | 0.24 |



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Basic Vessel Characteristics

Dimensions

- Length, Overall 226'-0"
- Length, Waterline 200'-0"
- Beam, Maximum 52'-0"
- Depth, Hull 28'-0"
- Draft, Design Waterline 18'-0"
- Freeboard, Main Deck 10'-0"



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Basic Vessel Characteristics

Capacities - Consumables

- Fuel 148,000 gal
- Potable Water 4,300 gal
- SW Ballast 200,000 gal
- Provisions 60 days
- Holding Capacity 24 hours



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Basic Vessel Characteristics

Capacities - Science

- Science Berths 26
- Science Labs 2,000 ft.²
- Deck Working Area 2,700 ft.²
- Science Storage Volume 8,000 ft.³
- Science Storage Load 100 LT



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Basic Vessel Characteristics

Performance

- Speed, Max. 14 kts
- Speed, Cruising 12 kts
- Level Ice 2.5 ft
- Endurance 45 days
- Installed Power 5,750 hp



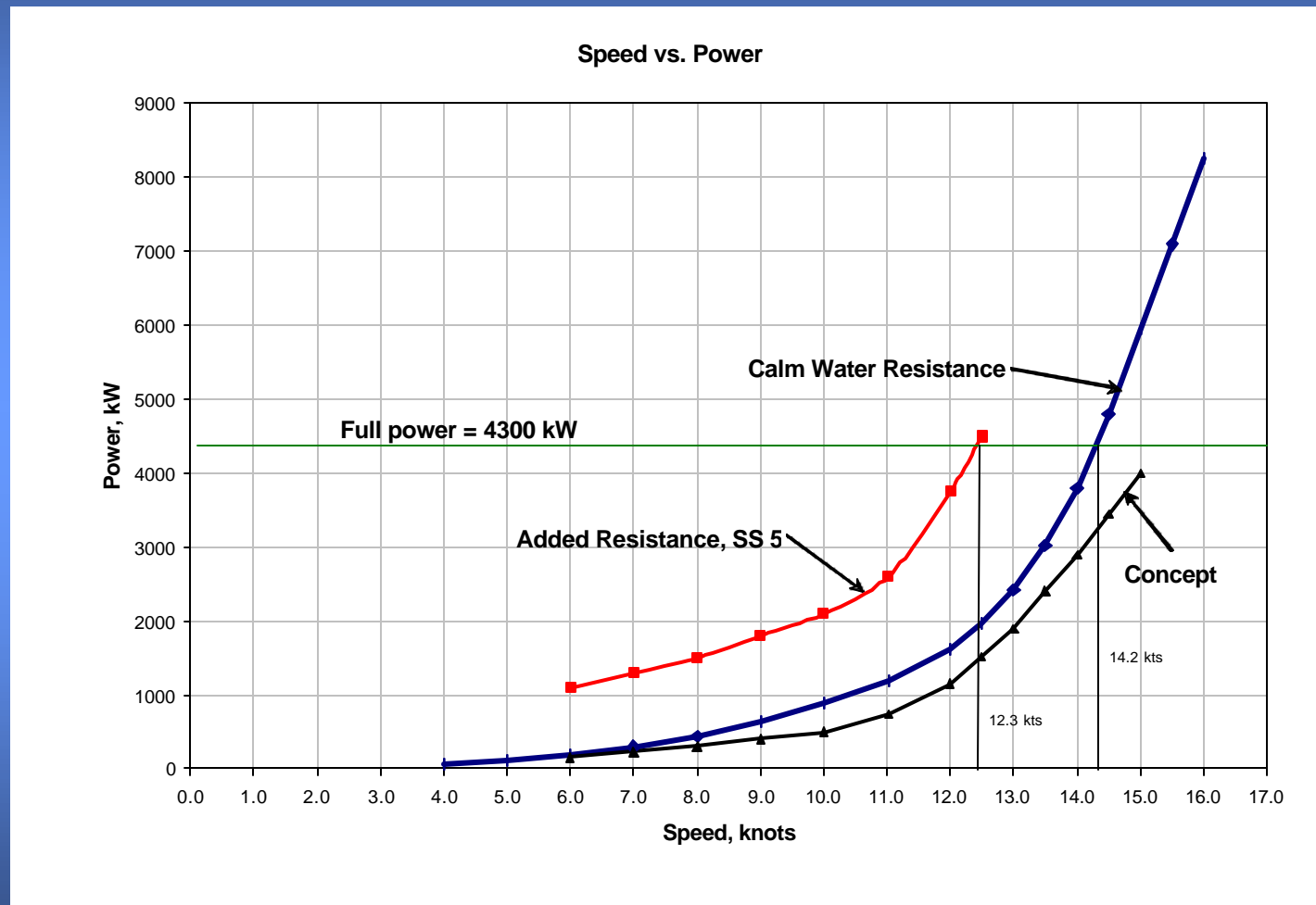
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Tasks Suggested At September Committee Meeting

- **Baseline Noise Survey**
 - ✓ *R/V Revelle*, 21 November 2002
 - ✓ Noise Control Engineering (NCE)
- **Independent Cost Analysis**
 - ✓ By IMCL
- **Develop Science Outfit Description/Costs**
 - ✓ Dale Chayes
 - ✓ Tom Smith

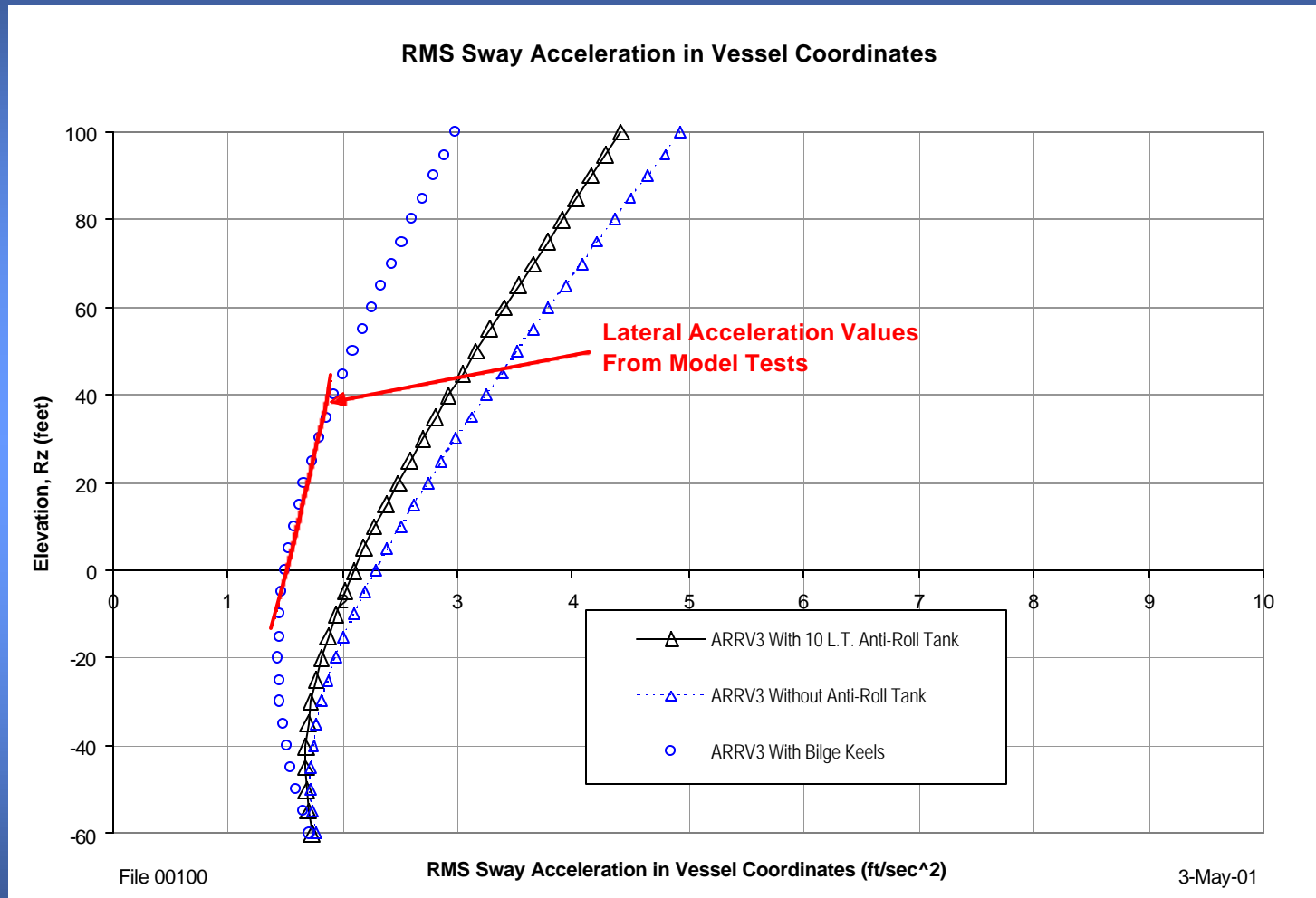
Model Test Results: Speed vs. Power



Model Test Results: Motions in SS 5

| Characteristic | Values From Model Tests | | | | Criteria |
|--|-------------------------|-------------------------|-----------------------------|----------------------------|----------|
| | V = 0 kts Beam Seas | V = 12 kts Head Seas | V = 12 kts Follow'g Seas | V = 6 kts Follow'g Seas | |
| Vertical Acceleration | | | | | |
| Bow | 0.08 g | 0.02 g | 0.19 g | 0.14 g | 0.20 g |
| Midship | 0.07 g | 0.01 g | 0.09 g | 0.05 g | 0.20 g |
| Stern | 0.07 g | 0.02 g | 0.14 g | 0.11 g | 0.20 g |
| Horizontal (Lateral) Acceleration | | | | | |
| High Bridge Deck | 0.06 g | | | | 0.10 g |
| Mid Main Deck | 0.05 g | | | | 0.10 g |
| Low Tank Top | 0.04 g | | | | 0.10 g |
| Roll Angle (RMS Value) | 3.62° | | | | 3.00° |
| Pitch Angle (RMS Value) | | 1.03° | 2.86° | 2.89° | 1.50° |
| Relative Motion (RMS Value) | | | | | |
| Bow | 1.15 ft | 2.49 ft | 8.27 ft | 7.81 ft | |
| Baltic Room Door | 4.20 ft | 1.05 ft | 1.18 ft | 1.58 ft | |
| Aft Working Deck, Starboard* | 3.12 ft | 1.61 ft | 2.66 ft | 1.94 ft | |
| Aft Working Deck, Port | 2.26 ft | 0.95 ft | 1.90 ft | 1.44 ft | |
| * Wave side in beam seas | | | | | |

Model Test Results: Lateral Accelerations in SS 5



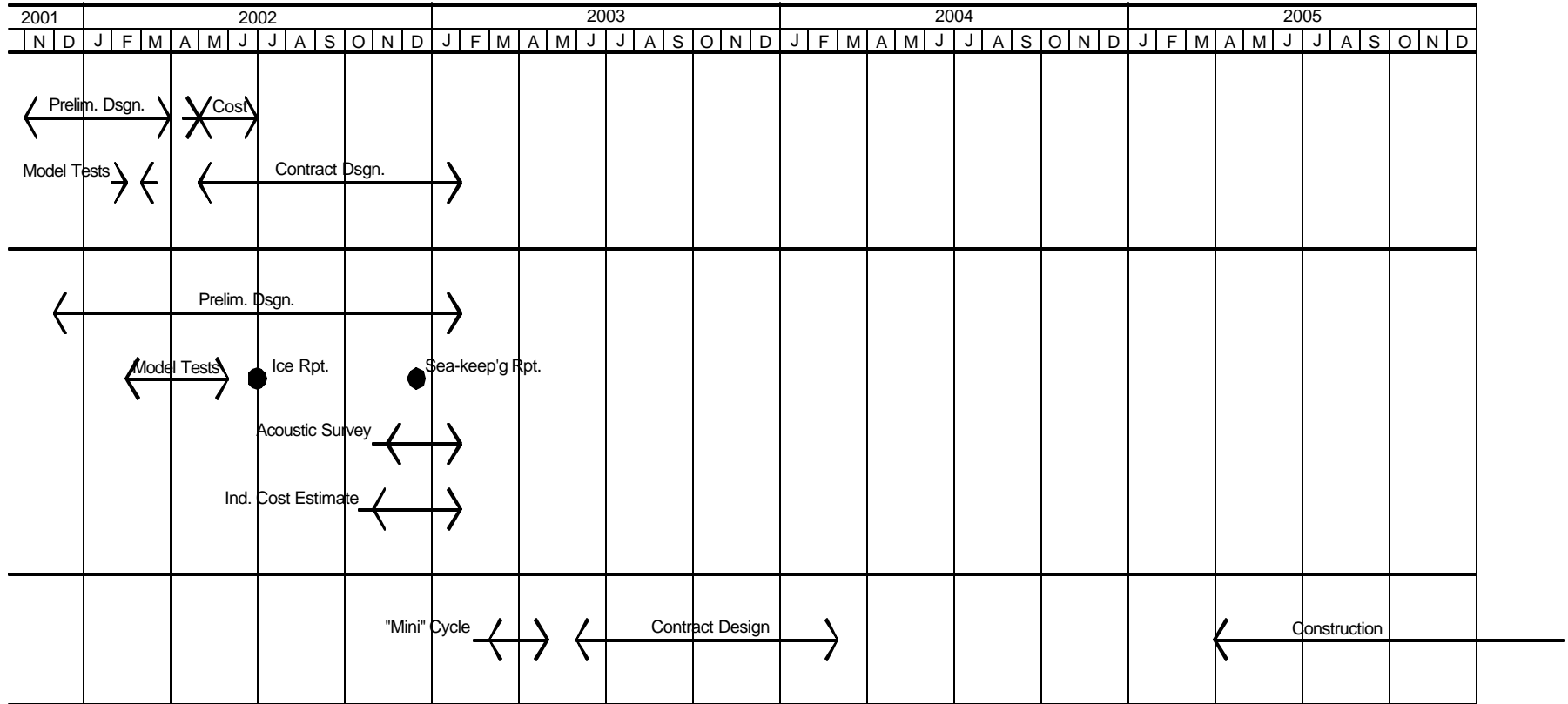
Intering Anti-Roll Tank Considerations

- Can not be arranged in double hull
 - ✓ Extensive structure required for ice-strengthened hull results in excessive damping of fluid in tank
 - ✓ Existing fuel tank spaces would need to be used with resultant loss of fuel capacity
- Requires approximately 90+ long tons of liquid
 - ✓ Approximately 20% of fuel deadweight capacity
- Only marginal improvement in motions
- Tank elimination removes ability to easily heel in ice

Current Design Constraints

- Cost
 - o Minimize
 - ✓ Principal Dimensions
 - ✓ Power
- Vessel Principal Dimensions
 - o Length – Limited by pier facility and cost
 - o Draft – Limited by operational area
 - o Beam – Limited by resistance considerations
- Ice Capability
 - o Defined by operational requirements
 - o Defines minimum power requirement
- Endurance
 - o Defines fuel deadweight requirement

Project Design Schedule



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