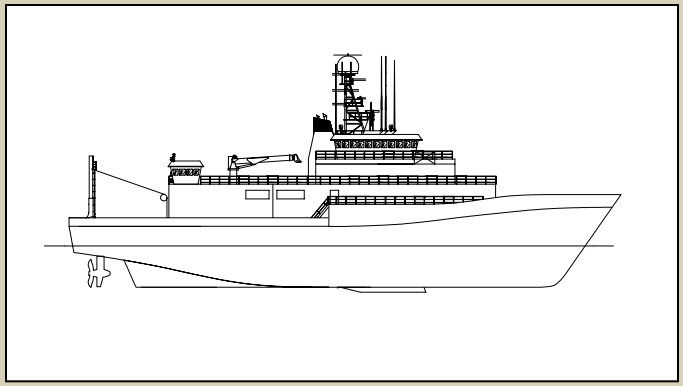
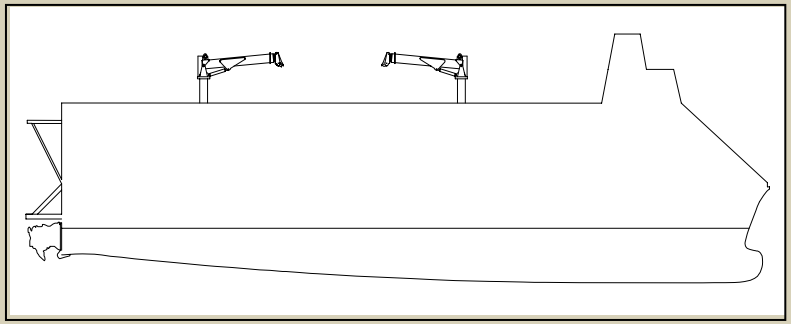
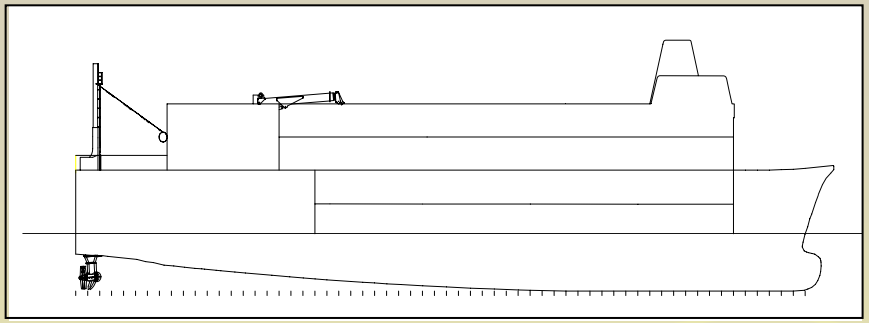
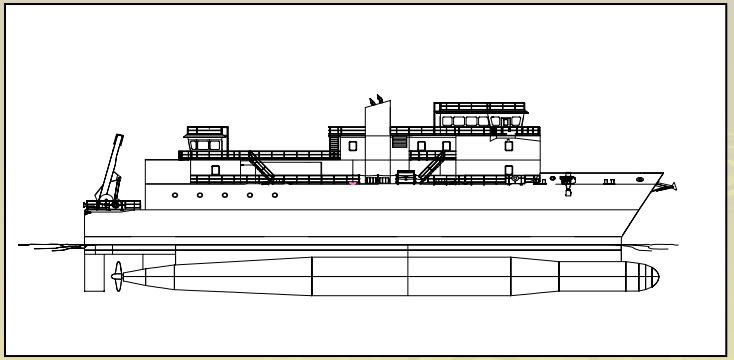
OCEAN Class AGOR









To: CNR
13 October 2004

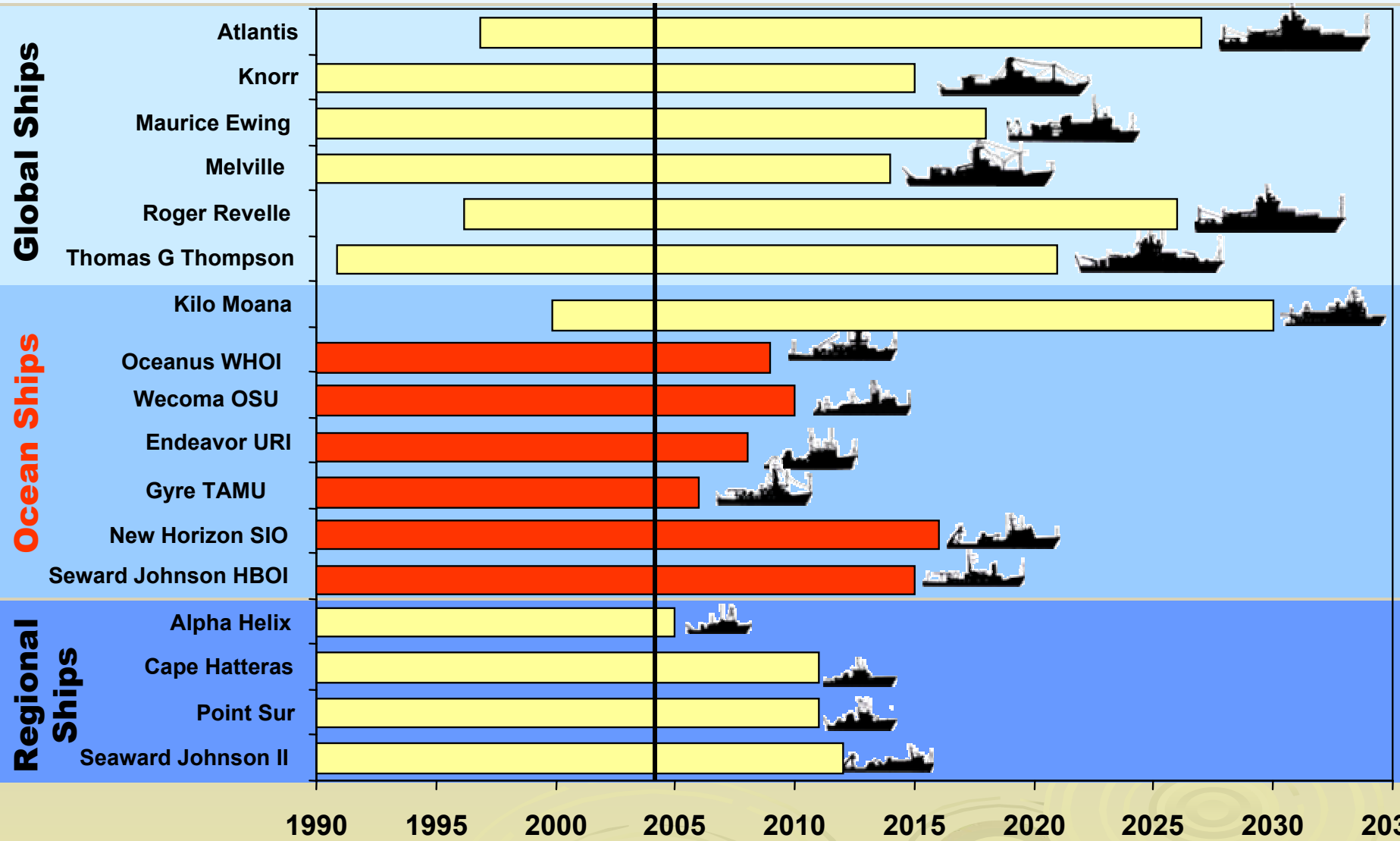
Construction Issues

- **Operator Selection**
- **Procurement Strategy**
- **Results of Hull Studies**

Operator Candidate Pool

- **Demonstrated capability to operate vessel of Ocean Class size.**
- **Vessel Retirement as condition of proposal**
- **Ongoing Cost share with Institution**
- **Operators with suitable retirement vessels**
  - WHOI – OCEANUS (NSF)
  - URI – ENDEAVOR (NSF)
  - OSU – WECOMA (NSF)
  - TAMU – GYRE (STATE)
  - HBOI – SEWARD JOHNSON (INSTITUTION)
  - SIO – NEW HORIZON (INSTITUTION)
  - Regional Consortia (IE: LUMCON, SECOR,NECOR, etc.)

Retirement of Vessels in the National Academic Research Fleet



Operator Selection Process

- Lease Staffing with ASN RD&A
- RFP issued from ONR
- Proposal Review Board
  - ONR Code 32
  - N61 (The Oceanographer of the Navy)
  - UNOLS
- CNR Selection
- Contract award for Operator support to NAVSEA, set up IPT's

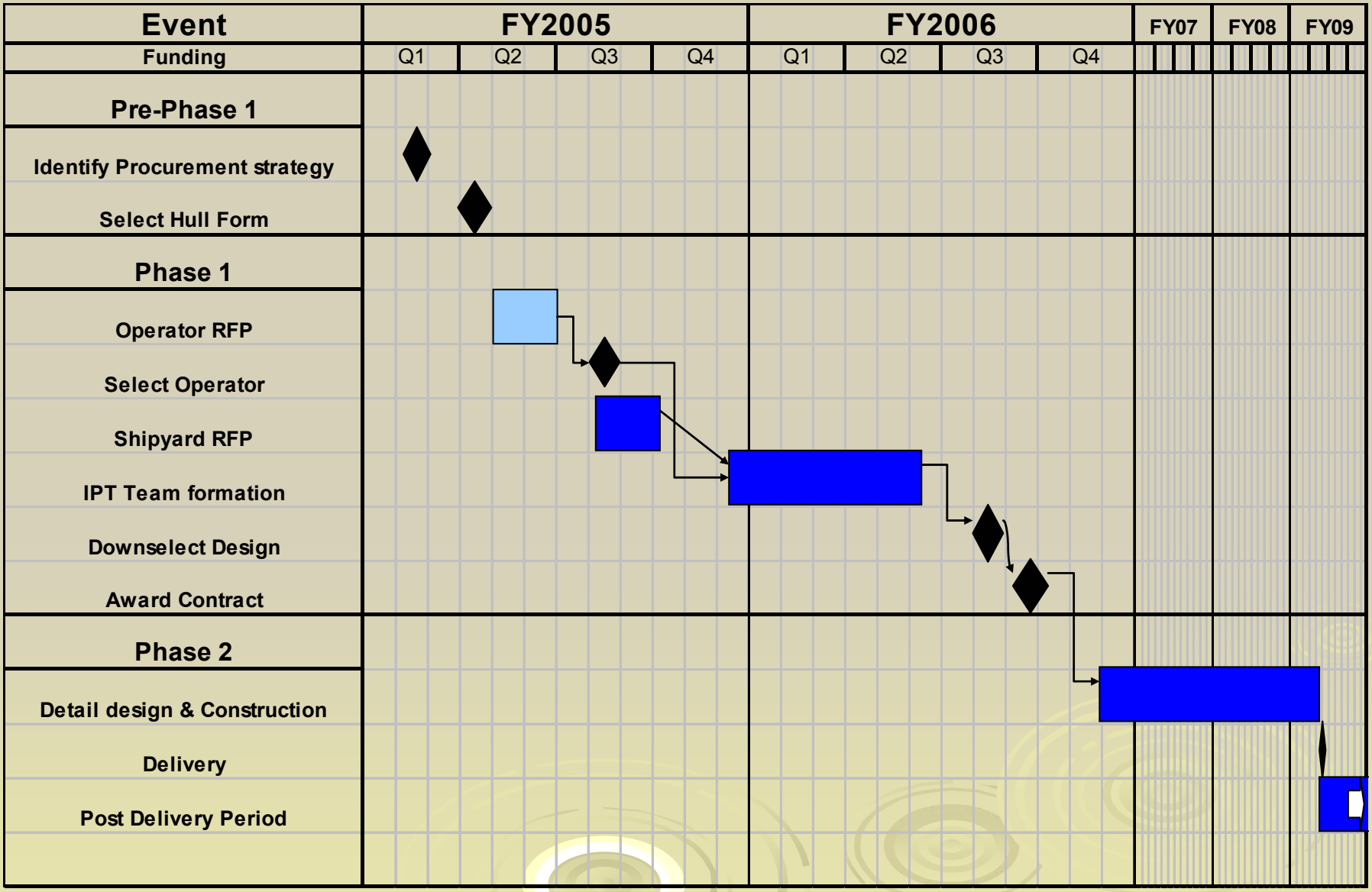
Procurement Strategy

- **MOU between ONR and NAVSEA**
- **2 Integrated Project Teams competing for design, IPT Contracts to start 1 Oct 2005**
- **Down selection, build will be an option to IPT contracts**
- **7 month design period to down select**
- **End result is Firm Fixed Price Bids from which one builder is selected**

IPT Concept
Two Phase Procurement

- **Phase 1: Design competition by 2 shipyard teams paid a fixed sum for design**
  - **ONR will own the designs at the conclusion**
  - **Advisory team will include Operator rep, Naval Architect, NAVSEA rep, UNOLS and technical experts as needed. Team works with both yards**
  - **Shipyards submit Firm Fixed Price bids at the conclusion and builder selection is made**
- **Phase 2 begins construction**

Ocean Class Procurement Timeline



Results of Hull Studies

- **Original Common Hull Study (May – Dec 2002)**
- **Original study has had several iterations with JJMA/NAVSEA (To present time)**
  - **Analysis of Mono – SWATH Hulls**
  - **Analysis of TAGS-51 vessels**
  - **Analysis of T-AGOS Stalwart Class**
  - **Analysis of X-Craft as an Ocean Class vessel**
- **Continuous involvement of UNOLS - FIC**
- **UNOLS development of Science Mission Requirements documents (July 2002)**

Science Mission Requirements

- **Defines Scientific functionality and vessel operational requirements**
- **Written at workshop funded by ONR and NSF held in July 2002**
- **Representation from UNOLS, NAVOCEANO, JJMA, NAVSEA , NOAA, ONR, NSF**
- **SMR available for 6 month review on UNOLS WWW Site**

SMR highlights

Accommodations:	**20 to 25 Scientists, 21 Crew (USCG inspected vessel)**
Range:	**10,800 NM at optimal cruising speed (≈11 Kt)**
Speed:	**Maintain 12 Knots in SS4**
Seakeeping:	**Maximize ability to work in SS5 and above**
Science load:	**200 Tons variable + ≈200 Tons installed science load**
Acoustics:	**Capability for 1 degree multibeam Sonar system**
Dynamic Positioning:	**Hold station in SS5, 35 Kt wind and 2 Kt current**
Design:	**ABS Classed, USCG inspected, SOLAS/ISM compliant**
Laboratories:	**2,000 Sq Ft**
Vans:	**Carry 2 standard 20 Ft ISO container Labs+ 2 odd size containers on deck.**

Ability of Hull Types To Meet Science Mission Requirements

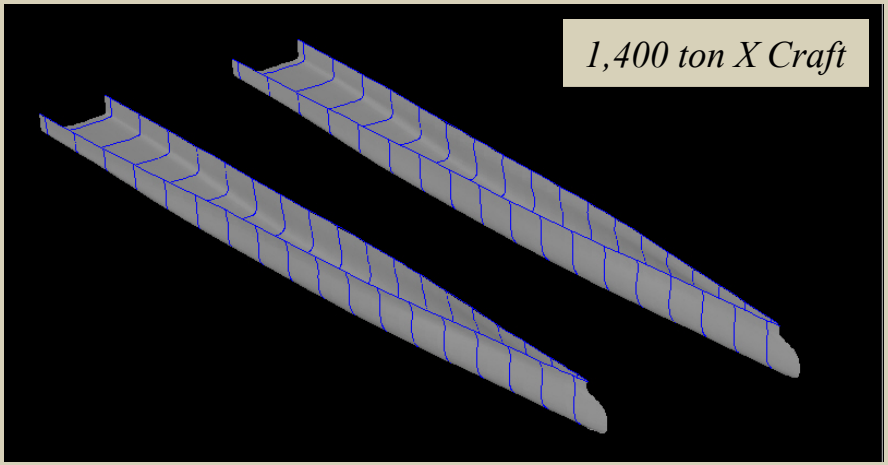
Hull Type	Monohull 2,400t	SWATH 2,400t	1,400t X Craft	2,400t X Craft
Propulsion	Diesel Electric Z Drive	Diesel Electric Propeller	Diesel Electric Z Drive	Diesel Electric Z Drive
Science Mission Requirements				
Science Accommodations			Insufficient load capacity for habitability and auxiliary systems	
Dynamic Positioning				
Range			Insufficient load capacity for fuel	
Speed				
Seakeeping	Meets SMRs except in long crested seas		SMR Motion limit criteria exceeded in sea states 5 and 6	
Overside Handling Operations		High freeboard complicates overside handling	High freeboard complicates overside handling	High freeboard complicates overside handling
Working Deck Area			Working deck is enclosed; limits long core handling	Working deck is enclosed; limits long core handling
Laboratories				
Vans				
Science Storage				
Variable Science Payload			Insufficient load capacity for itinerant science loads	
Permanent Science Load			Insufficient load capacity for winches, handling sys, and cranes	
Sonar Performance		Insufficient hull beam for one degree multibeam receive array	Insufficient hull beam for one degree multibeam receive array	Insufficient hull beam for one degree multibeam receive array
ABS Class and USCG Certified				
ROM Ship Cost (FY06 $M)	60	68 - 75	60 - 70	80 - 90
"Bare Bones" Total Pgm Cost (FY06 $M)	70	78 - 85	70 - 80	90 - 100
Operating Day Rate Cost ($)	$20,145	$21,184	$19,833	$21,824

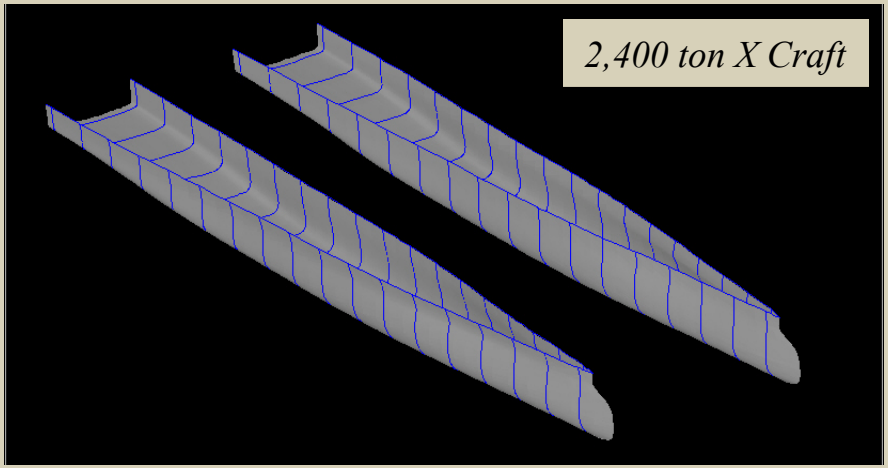
= Fully meets SMRs or could meet with minor impact

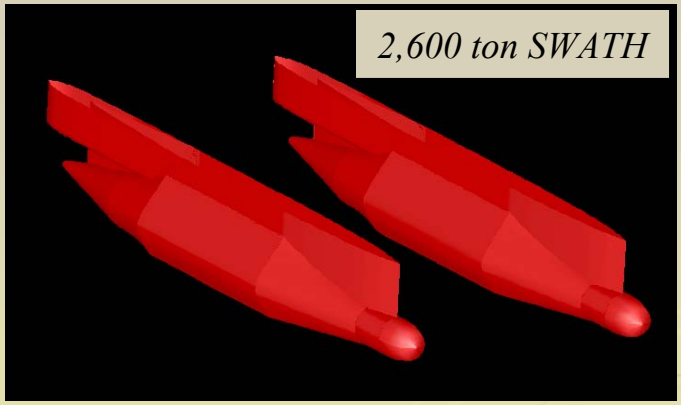
= Moderate risk of not meeting SMRs

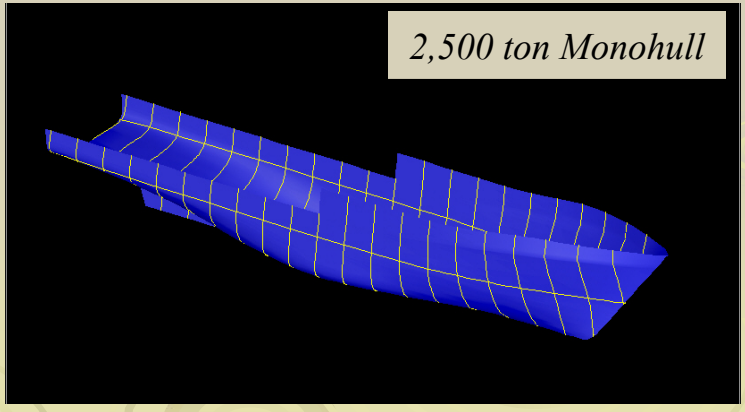
= High risk of not meeting SMRs

Comparison of Hull Forms









Speed VS Cost benefit

- **Transit portion of AGOR missions averages 23%; remainder is on-station, instrument towing, or sonar survey at <12 knots**

Ship	*Propulsion*	*Transit Speed*	*Fuel GPD at Transit Speed*	*Annual Fuel Cost*	*Productivity Rate*
2,400 ton X craft	Diesel Electric Z drive	12	4,000	$0.9M	1.00
2,400 ton X craft	CODOG Waterjet	26	44,000	$4.1M	1.15
2,400 ton X craft	CODOG Waterjet	40	107,000	$6.7M	1.21

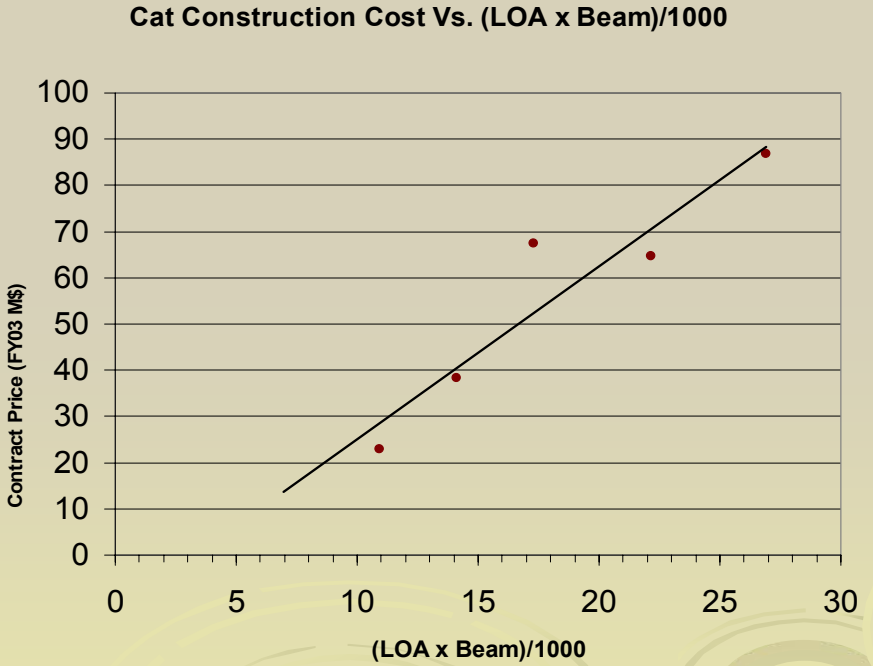
- **Increasing transit speed from 12 knots to 40 knots can improve ship productivity by 21%, but at significant increase in fuel consumption**

OCEAN Class AGOR Cost Analysis Based On Recent Ship Contract Prices

	Contract Price	*Total in FY07$*	*Displacement*	*LS Weight*	*$/Lightship Ton (FY07 $)*	
MONOHULL						
NOAA FRV	$43,000,000	$52,884,576	2,439	1,810	$29,211	
AGOR 24	$40,700,000	$63,409,274	3,315	2,226	$28,486	
T-AGS 60	$53,900,000	$89,088,487	4,800	2,970	$30,000	
T-AGS 63	$55,682,817	$81,772,094	4,800	2,970	$27,536	
T-AGS 64	$60,854,922	$84,237,445	4,800	2,970	$28,366	
T-AGS 65	$62,980,196	$84,640,117	4,800	2,970	$28,502	
Monohull AVG					$28,683	
Cost of OCEAN Class					**x 1,843 LS tons =**	**$52,863,344**
SWATH						
KILO MOANA	$49,000,000	$62,071,734	2,512	2,014	$30,820	
Cost of OCEAN Class					**x 2,014 LS tons =**	**$62,071,734**

OCEAN Class AGOR Cost Analysis Based On Recent Ship Contract Prices

ALUMINUM CATAMARAN	*Contract Year*	*Contract Price*	*Total in FY07$*	*Length(ft)*	*Beam (ft)*	*Length x Beam/1000*
Lake Express	2003	19,500,000	21,947,422	191	57	10.94
Fairweather	2003	34,000,000	38,267,300	235	60	14.10
Jonathan Swift	2003	57,500,000	64,716,757	284	78	22.15
ONR X Craft	2003	59,900,000	67,417,978	240	72	17.28
Hawaiian Superferry	2002	75,000,000	86,945,556	345	78	26.91



X Craft has LOA x B/1000 of 17.28 which yields $52M construction cost from graph. Add in design cost of approximately 13% to get $58M.

Operating Cost Analysis

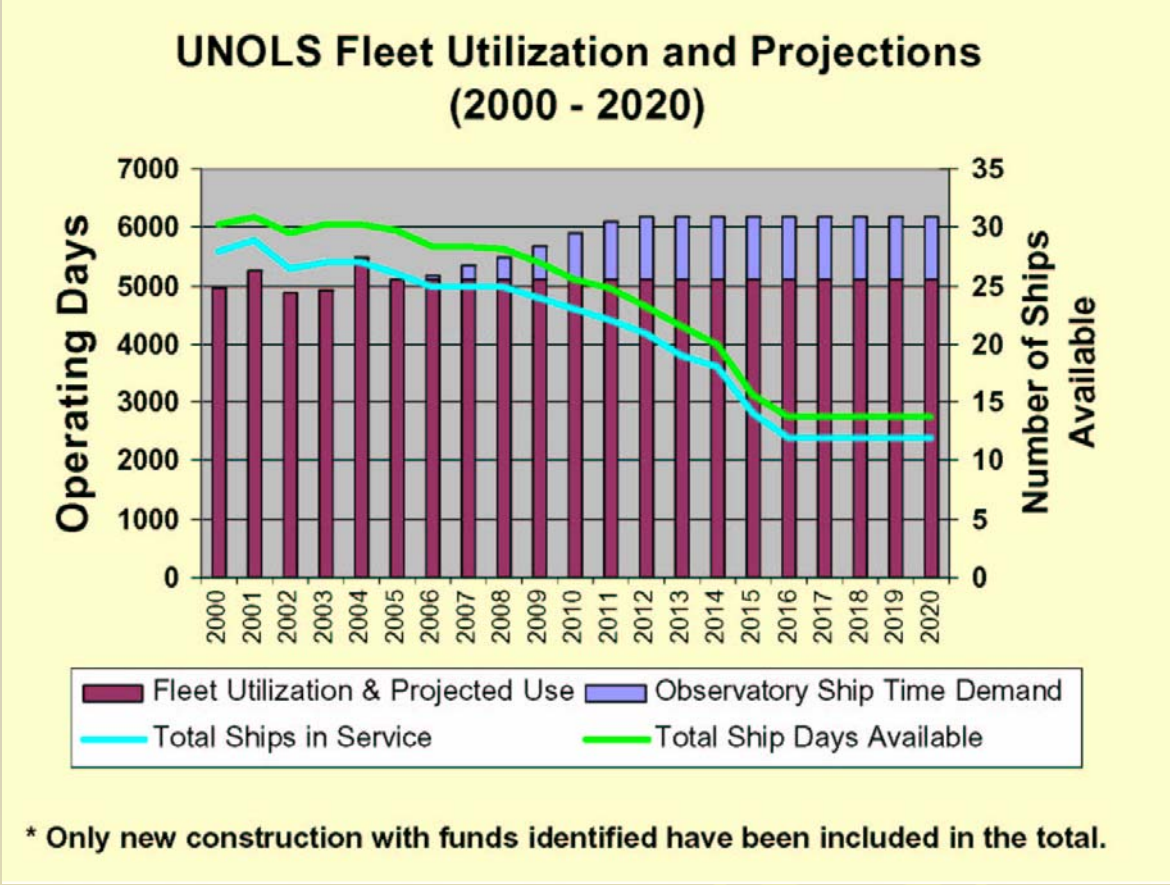
	Large AGOR Averages					OCEAN Class Feasibility Designs					
								X Craft Variants			
Year	2001	2002	2003	2004	Ratio	Monohull	SWATH	2400t Z dr	2400t Jet	1400t Z dr	1400t Jet
Salaries & Wages											
A. Ship's company											
1. Salaries	$968,474	$1,006,119	$1,005,830	$1,010,798							
2. Overtime	$586,163	$677,495	$553,898	$514,210							
3. Shore Leave	$147,653	$177,615	$247,872	$451,044							
4. Fringe Benefits	$283,241	$307,706	$321,329	$459,089							
TOTAL	$1,985,532	$2,168,936	$2,128,929	$2,435,141	Use 2004	$2,435,141	$2,435,141	$2,435,141	$2,435,141	$2,435,141	$2,435,141
B. Marine Operations Staff											
1. Salaries	$226,602	$243,280	$248,220	$232,179							
2. Overtime	$648	$877	$2,821	$0							
3. Benefits	$56,051	$63,798	$71,597	$88,990							
TOTAL	$283,301	$307,955	$322,637	$321,169	Use 2004	$321,169	$321,169	$321,169	$321,169	$321,169	$321,169
Repairs & Maintenance											
A. Normal Maint. & Repair	$261,787	$363,632	$260,971	$200,000	4 yr avg ratioed by disp	$227,438	$271,598	$271,598	$271,598	$271,598	$271,598
B. MOSA	$423,232	$555,250	$442,448	$589,600	2004 ratioed by disp	$493,736	$513,486	$473,987	$513,486	$276,492	$276,492
TOTAL	$685,019	$918,882	$703,419	$789,600		$721,174	$785,083	$745,584	$785,083	$548,090	$548,090
Other Expenses											
A. Fuel & Lube Oil	$674,312	$643,821	$692,627	$833,741	Calculated	$692,995	$883,208	$1,099,200	$1,568,039	$870,661	$1,148,174
B. Food	$122,728	$182,921	$162,179	$196,864	2004 ratioed by compl	$161,710	$161,710	$161,710	$161,710	$161,710	$161,710
C. Insurance	$61,717	$75,796	$84,777	$107,148	Use 2004	$107,148	$107,148	$107,148	$107,148	$107,148	$107,148
D. Stores Minor Equip., & Supplies	$140,192	$177,756	$155,344	$137,440	4 yr avg ratioed by compl	$125,418	$125,418	$125,418	$125,418	$125,418	$125,418
E. Travel											
Domestic	$29,770	$44,778	$52,615	$58,494	4 yr avg ratioed by crew	$46,414	$46,414	$46,414	$46,414	$46,414	$46,414
Foreign	$134,414	$117,258	$77,486	$27,131	4 yr avg ratioed by crew	$106,038	$106,038	$106,038	$106,038	$106,038	$106,038
F. Shore Facilities Support	$94,579	$109,355	$139,566	$168,652	Use 2004	$168,652	$168,652	$168,652	$168,652	$168,652	$168,652
G. Miscellaneous	$229,409	$297,513	$195,684	$180,780	4 yr avg ratioed by disp	$189,126	$196,691	$181,561	$196,691	$105,910	$105,910
H. Amortization											
Total	$1,487,121	$1,649,197	$1,560,277	$1,710,250		$1,597,501	$1,795,279	$1,996,141	$2,480,110	$1,691,951	$1,969,464
Total Direct Costs	$3,755,954	$4,126,089	$4,011,843	$5,256,160		$5,074,985	$5,336,672	$5,498,035	$6,021,503	$4,996,352	$5,273,865
Indirect Costs	$596,378	$625,818	$606,888	$676,311	13% of direct	$659,748	$693,767	$714,745	$782,795	$649,526	$685,602
Total Operating Costs	$4,352,332	$4,751,907	$4,618,731	$5,932,471		$5,734,734	$6,030,440	$6,212,780	$6,804,299	$5,645,877	$5,959,467
Miscellaneous Data											
A. Number of Cruises/Legs	15	18	16	18							
B. Operating Days	283	297	266	293	Avg	285	285	285	285	285	285
C. Days at Sea	247	268	242	268							
D. Maintenance Days	48	45	40	23							
E. Days Out of Service	26	0	24	6							
F. Daily Rate	$17,722	$19,193	$20,108	$20,282		$20,145	$21,184	$21,824	$23,902	$19,833	$20,935
Ship Particulars:											
Displacement, LT				2,985		2500	2600	2400	2600	1400	1400
Crew				21		21	21	21	21	21	21
Sci				35		25	25	25	25	25	25
Total Comp				56		46	46	46	46	46	46

Evolving Pressure on UNOLS Fleet

- **Annual ship time demand will approach 3 ship years per year of Global time for maintenance**

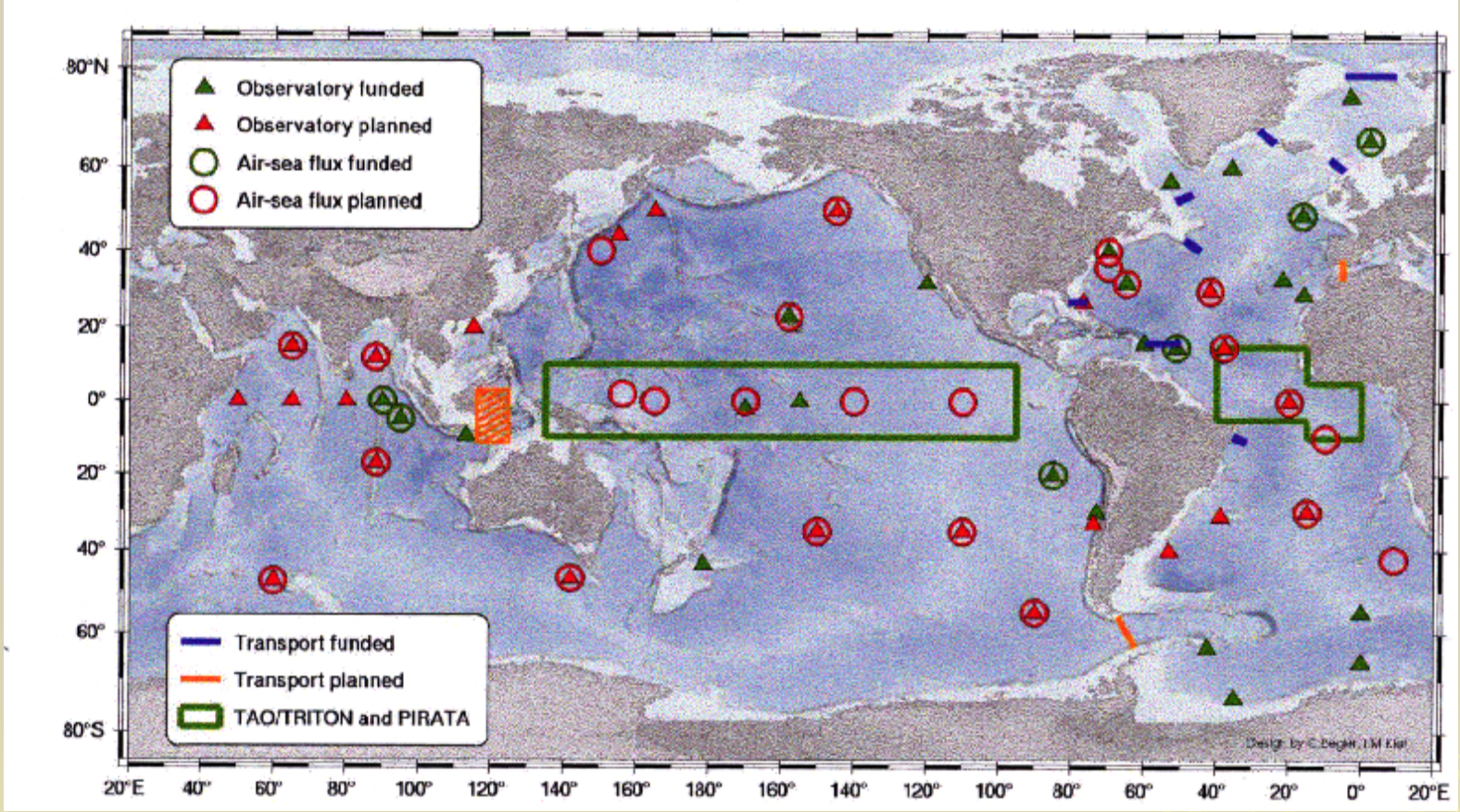
- **Reports call for increased capabilities:**
  - **Double Global heavy lift capabilities (Cranes, winches, A frames)**
  - **Enhanced and redundant Dynamic Positioning**

- **FOFC Fleet Renewal 5 year update**
  - **FOFC Agency workshop – July 2004**
  - **Status report at UNOLS Annual meeting**
  - **Report due in July 2005**



*** Only new construction with funds identified have been included in the total.**

Ocean Observatory Network



Recommendations

- **Announcement of ship procurement starting in FY2006**
- **Announcement of impending RFP for operator of Ocean Class ship**
- **Request selection (ratification) of hull form by January 2005**
- **Establish MOU with NAVSEA for project management**
- **Establish a program office within Code 32.**

Table of Operability, JJMA

						Short-Crested			*Long-Crested*		
Region	**Season**	**Perf. Index**	**Mission**	**Sea State**	**SMR**	**Mono Hull**	**SWATH**	**X-Craft**	**Mono Hull**	**SWATH**	**X-Craft**
Atlantic, N.	Annual	SPI-1	All	Spectrum	75% Winter	83%	86%	74%	76%	86%	68%
Pacific, N.	Annual	SPI-1	All	Spectrum	75% Winter	85%	83%	78%	77%	83%	68%
Atlantic, N.	Winter	PTO	On Station	SS4	100%	100%	100%	100%	100%	100%	93%
Atlantic, N.	Winter	PTO	On Station	SS5	80%	95%	99%	78%	83%	95%	64%
Atlantic, N.	Winter	PTO	On Station	SS6	50%	53%	63%	39%	34%	64%	10%
Atlantic, N.	Winter	PTO	Transit	SS4	100%	100%	100%	94%	100%	100%	85%
Atlantic, N.	Winter	PTO	Transit	SS5	80%	94%	99%	65%	81%	98%	54%
Atlantic, N.	Winter	PTO	Transit	SS6	50%	55%	80%	32%	37%	78%	12%
Pacific, NW	Winter	PTO	On Station	SS4	100%	100%	100%	100%	100%	100%	93%
Pacific, NW	Winter	PTO	On Station	SS5	80%	95%	95%	84%	83%	92%	70%
Pacific, NW	Winter	PTO	On Station	SS6	50%	81%	64%	83%	63%	64%	38%
Pacific, NW	Winter	PTO	Transit	SS4	100%	100%	100%	94%	100%	100%	85%
Pacific, NW	Winter	PTO	Transit	SS5	80%	94%	98%	72%	81%	97%	56%
Pacific, NW	Winter	PTO	Transit	SS6	50%	81%	83%	60%	63%	80%	32%

Notes:

1) PTO = Percent time operability in a given sea state; SPI-1 = Seakeeping performance index (probability weighted across sea spectrum)

2) PTO analysis accounts for probability of significant wave heights for specific regions in Winter (January-March)

3) SPI-1 analysis assumes most probable modal wave periods for N. Atlantic and N. Pacific (Bales)