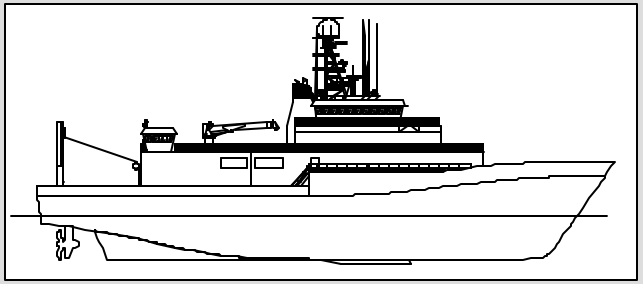
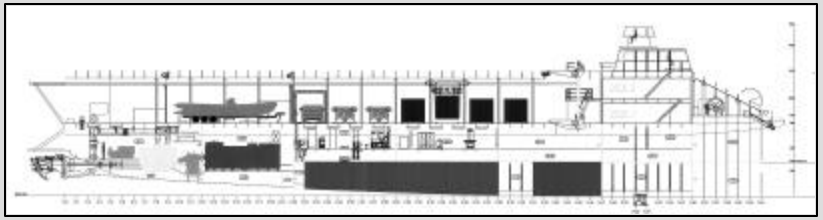
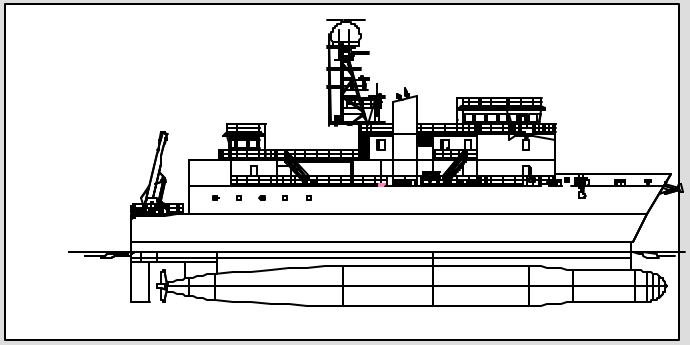
# *OCEAN Class AGOR*
# *Concept Definition Task*







*3rd Web Meeting*

*20 May 2004*

# OCEAN Class AGOR

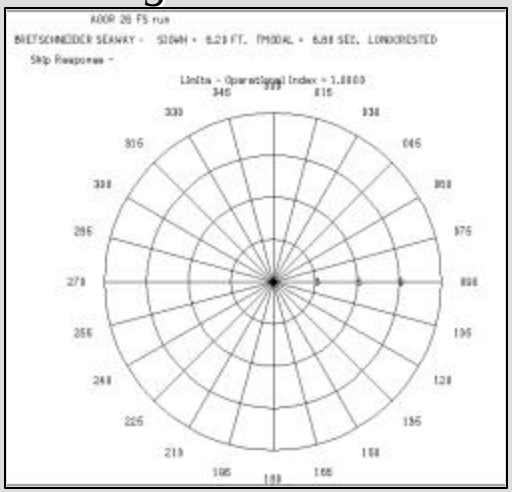
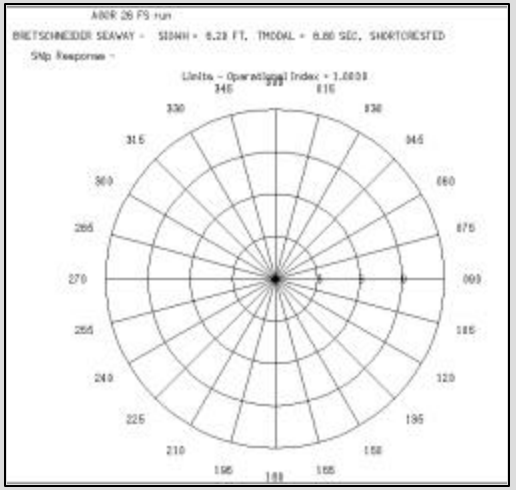
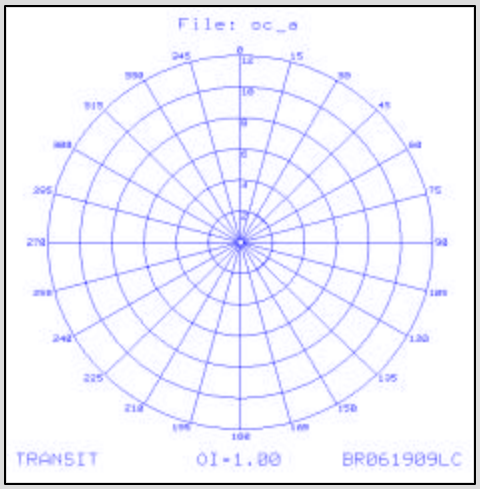
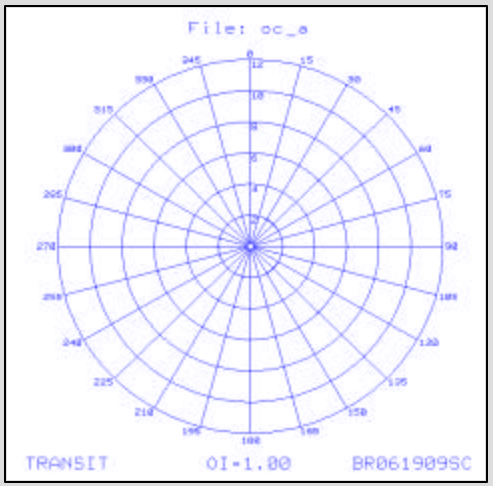
# Concept Definition

## *Status of OCEAN Class Concept Design Effort*

| Meeting Date | Monohull | SWATH | X Craft |
|---|---|---|---|
| 02-Apr-04 | Initial Concept Design<br>- Hull Form<br>- Arrangement<br>- Seakeeping<br>- Propulsion | | Initial Concept Design<br>- Hull Form<br>- Arrangement<br>- Propulsion |
| 27-Apr-04 | Revised Concept Design<br>- Arrangement Revised to Reflect Comments<br>- PH Location sketch - fwd vs. midship<br>- Fuel endurance calc revised | Initial Concept Design<br>- Hull Form<br>- Arrangement<br>- Propulsion | Revised Concept Design<br>- Z Drive Variant<br>- Waterjet Variant |
| 20-May-04 | Revised Design IAW Comments<br>Op Cost Calcs | Revised Design IAW Comments<br>Op Cost Calcs<br>Seakeeping Analysis | Revised Design IAW Comments<br>Op Cost Calcs<br>Additional ONR Investigation |
| In Progress | Const. Cost Analysis<br>Further refinement of design | Finish Seakeeping Analysis<br>Const. Cost Analysis<br>Further refinement of design | Seakeeping Analysis<br>Const. Cost Analysis<br>Further refinement of design |

## Seakeeping - SWATH and Monohull

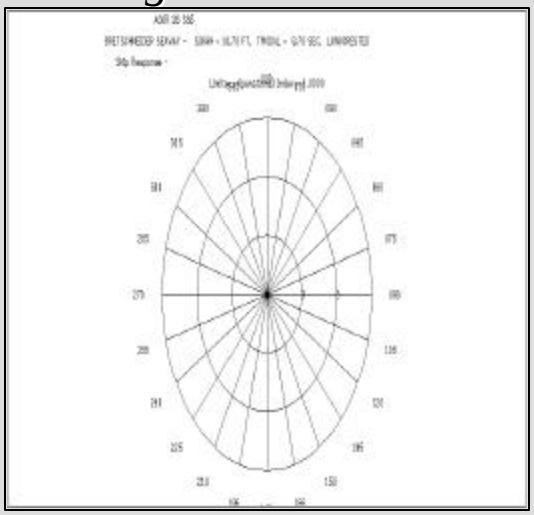
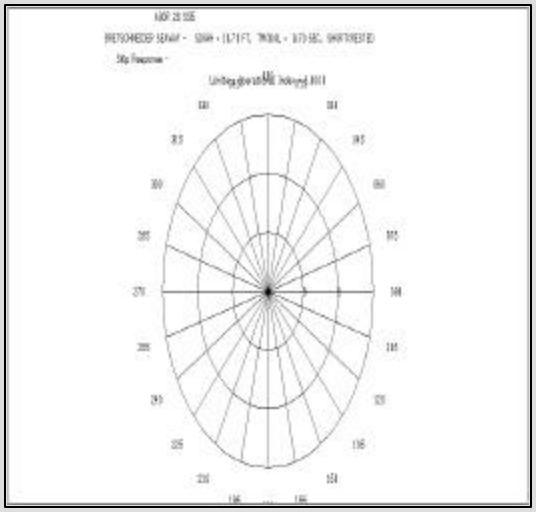
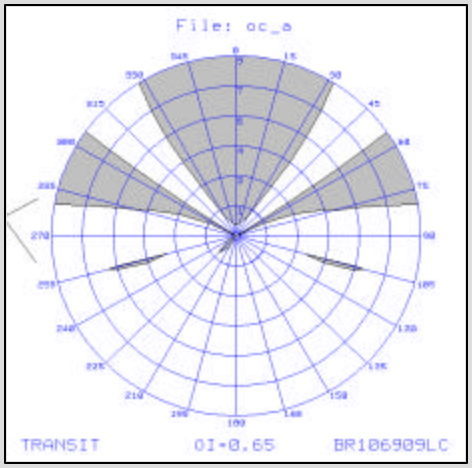
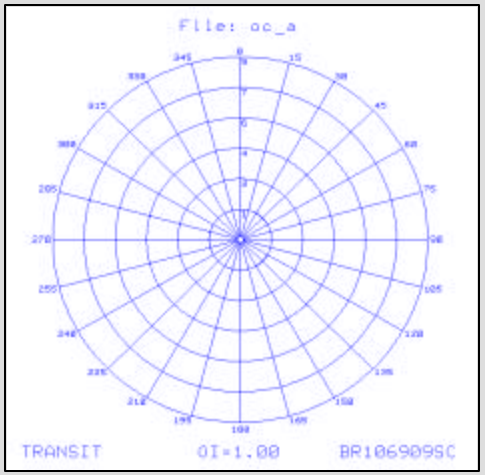
### Transit, MID SS4, Tm=8.8s

| | *Long-Crested Seas* | *Short-Crested Seas* |
|---|---|---|
| **SWATH** |  |  |
| **Monohull** |  |  |

*Shaded Areas Exceed Motion Criteria*

## Seakeeping - SWATH and Monohull

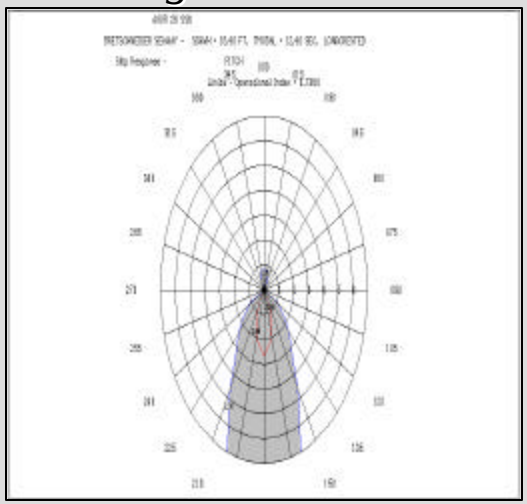
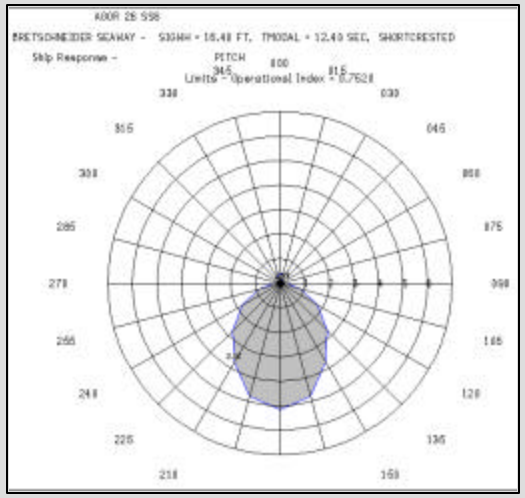
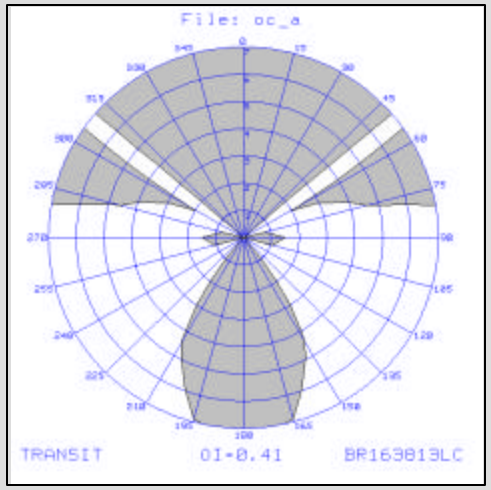
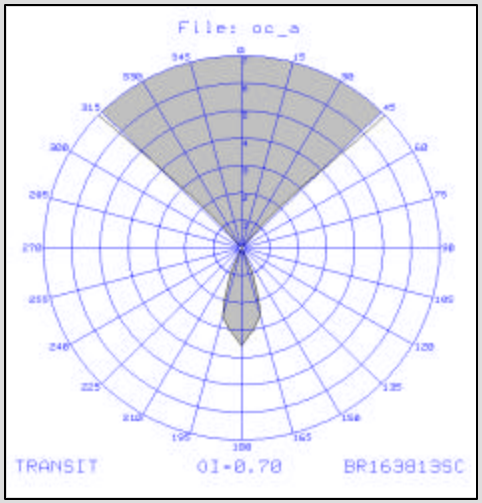
### Transit, MID SS5, Tm=9.7s

| | *Long-Crested Seas* | *Short-Crested Seas* |
|---|---|---|
| *SWATH* |  |  |
| *Monohull* |  |  |

*Shaded Areas Exceed Motion Criteria*

## Seakeeping - SWATH and Monohull

### Transit, MID SS6, Tm=12.4s

| | *Long-Crested Seas* | *Short-Crested Seas* |
|---|---|---|
| *SWATH* |  |  |
| *Monohull* |  |  |

*Shaded Areas Exceed Motion Criteria*

# OCEAN Class AGOR Concept Definition

# Fuel Operating Cost Calculation

**Monohull**

| | Cruise | Transit | | | | Towing/Survey | | | On Station | | Total Days | Avg Daily Fuel Cost | Cruise Fuel Cost | Yearly Fuel & Lube Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Speed | Days | NM | $/day fuel | Speed | Days | $/day fuel | Days | $/day fuel | | | | |
| 1 | 2D,3D High Res Sonar | 12 | 2 | 576 | $5,043 | 5 | 30 | $1,945 | 2 | $2,226 | 34 | $2,144 | $72,894 | FOY = |
| 2 | Piston Coring | 12 | 4 | 1,152 | $5,043 | | | | 20 | $2,226 | 24 | $2,696 | $64,697 | 300 |
| 3 | Observatory Servicing | 12 | 1 | 288 | $5,043 | 10 | 7 | $3,397 | 6 | $2,226 | 14 | $3,013 | $42,179 | days |
| 4 | Current Meter Moorings, etc. | 12 | 3 | 864 | $5,043 | 8 | 10 | $2,518 | 14 | $2,226 | 27 | $2,647 | $71,475 | |
| 5 | Bio & Physical Survey | 14 | 1 | 336 | $8,485 | 12 | 2 | $5,043 | 7 | $2,226 | 10 | $3,416 | $34,155 | |
| 6 | Deployment of Moorings | 10 | 20 | 4,800 | $3,397 | 10 | 1 | $3,397 | 4 | $2,226 | 25 | $3,210 | $80,241 | |
| 7 | LaGrangian Float Studies | 12 | 8 | 2,304 | $5,043 | 10 | 27 | $3,397 | | | 35 | $3,773 | $132,057 | |
| 8 | Open Ocean Bio/Chem Int. | 12 | 2 | 576 | $5,043 | 6 | 26 | $2,013 | | | 28 | $2,229 | $62,421 | |
| 9 | Laying Cable for Observ. | 12 | 5 | 1,440 | $5,043 | 5 | 5 | $1,945 | 10 | $2,226 | 20 | $2,860 | $57,202 | |
| 10 | Moving Ship Tomography | 12 | 15 | 4,320 | $5,043 | | | | 15 | $2,226 | 30 | | | |
| | | | 61 | | | | 108 | | 78 | | 247 | $2,887 | | $866,243 |

**SWATH**

| | Cruise | Transit | | | | Towing/Survey | | | On Station | | Total Days | Avg Daily Fuel Cost | Cruise Fuel Cost | Yearly Fuel & Lube Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Speed | Days | NM | $/day fuel | Speed | Days | $/day fuel | Days | $/day fuel | | | | |
| 1 | 2D,3D High Res Sonar | 12 | 2 | 576 | $5,828 | 5 | 30 | $2,363 | 2 | $2,800 | 34 | $2,592 | $88,130 | FOY = |
| 2 | Piston Coring | 12 | 4 | 1,152 | $5,828 | | | | 20 | $2,800 | 24 | $3,305 | $79,310 | 300 |
| 3 | Observatory Servicing | 12 | 1 | 288 | $5,828 | 10 | 7 | $4,375 | 6 | $2,800 | 14 | $3,804 | $53,253 | days |
| 4 | Current Meter Moorings, etc. | 12 | 3 | 864 | $5,828 | 8 | 10 | $3,238 | 14 | $2,800 | 27 | $3,298 | $89,058 | |
| 5 | Bio & Physical Survey | 14 | 1 | 336 | $7,840 | 12 | 2 | $5,828 | 7 | $2,800 | 10 | $3,910 | $39,095 | |
| 6 | Deployment of Moorings | 12 | 20 | 5,760 | $5,828 | 10 | 1 | $4,375 | 4 | $2,800 | 25 | $5,285 | $132,125 | |
| 7 | LaGrangian Float Studies | 12 | 8 | 2,304 | $5,828 | 10 | 27 | $4,375 | | | 35 | $4,707 | $164,745 | |
| 8 | Open Ocean Bio/Chem Int. | 12 | 2 | 576 | $5,828 | 6 | 26 | $2,538 | | | 28 | $2,773 | $77,630 | |
| 9 | Laying Cable for Observ. | 12 | 5 | 1,440 | $5,828 | 5 | 5 | $2,363 | 10 | $2,800 | 20 | $3,448 | $68,950 | |
| 10 | Moving Ship Tomography | 12 | 15 | 4,320 | $5,828 | | | | 15 | $2,800 | 30 | | | |
| | | | 61 | | | | 108 | | 78 | | 247 | $3,680 | | $1,104,011 |

**X Craft - Propeller Drive**

| | Cruise | Transit | | | | Towing/Survey | | | On Station | | Total Days | Avg Daily Fuel Cost | Cruise Fuel Cost | Yearly Fuel & Lube Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Speed | Days | NM | $/day fuel | Speed | Days | $/day fuel | Days | $/day fuel | | | | |
| 1 | 2D,3D High Res Sonar | 12 | 2 | 576 | $7,028 | 5 | 30 | $2,142 | 2 | $2,887 | 34 | $2,473 | $84,093 | FOY = |
| 2 | Piston Coring | 12 | 4 | 1,152 | $7,028 | | | | 20 | $2,887 | 24 | $3,577 | $85,858 | 300 |
| 3 | Observatory Servicing | 12 | 1 | 288 | $7,028 | 10 | 7 | $4,780 | 6 | $2,887 | 14 | $4,129 | $57,812 | days |
| 4 | Current Meter Moorings, etc. | 12 | 3 | 864 | $7,028 | 8 | 10 | $3,388 | 14 | $2,887 | 27 | $3,533 | $95,387 | |
| 5 | Bio & Physical Survey | 14 | 1 | 336 | $10,179 | 12 | 2 | $7,028 | 7 | $2,887 | 10 | $4,445 | $44,446 | |
| 6 | Deployment of Moorings | 12 | 20 | 5,760 | $7,028 | 10 | 1 | $4,780 | 4 | $2,887 | 25 | $6,276 | $156,896 | |
| 7 | LaGrangian Float Studies | 12 | 8 | 2,304 | $7,028 | 10 | 27 | $4,780 | | | 35 | $5,294 | $185,289 | |
| 8 | Open Ocean Bio/Chem Int. | 12 | 2 | 576 | $7,028 | 6 | 26 | $2,477 | | | 28 | $2,802 | $78,452 | |
| 9 | Laying Cable for Observ. | 12 | 5 | 1,440 | $7,028 | 5 | 5 | $2,142 | 10 | $2,887 | 20 | $3,736 | $74,724 | |
| 10 | Moving Ship Tomography | 12 | 15 | 4,320 | $7,028 | | | | 15 | $2,887 | 30 | $4,958 | | |
| | | | 61 | | | | 108 | | 78 | | 247 | $4,580 | | $1,374,110 |

**X Craft - Waterjet Drive**

| | Cruise | Transit | | | | Towing/Survey | | | On Station | | Total Days | Avg Daily Fuel Cost | Cruise Fuel Cost | Yearly Fuel & Lube Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Speed | Days | NM | $ fuel | Speed | Days | $/day fuel | Days | $/day fuel | | | | |
| 1 | 2D,3D High Res Sonar | 12 | 2 | 576 | $11,646 | 5 | 30 | $2,480 | 2 | $2,887 | 34 | $3,043 | $103,473 | FOY = |
| 2 | Piston Coring | 12 | 4 | 1,152 | $11,646 | | | | 20 | $2,887 | 24 | $4,347 | $104,330 | 300 |
| 3 | Observatory Servicing | 12 | 1 | 288 | $11,646 | 10 | 7 | $7,826 | 6 | $2,887 | 14 | $5,982 | $83,749 | days |
| 4 | Current Meter Moorings, etc. | 12 | 3 | 864 | $11,646 | 8 | 10 | $4,872 | 14 | $2,887 | 27 | $4,596 | $124,082 | |
| 5 | Bio & Physical Survey | 14 | 1 | 336 | $17,557 | 12 | 2 | $11,646 | 7 | $2,887 | 10 | $6,106 | $61,061 | |
| 6 | Deployment of Moorings | 12 | 20 | 5,760 | $11,646 | 10 | 1 | $7,826 | 4 | $2,887 | 25 | $10,092 | $252,303 | |
| 7 | LaGrangian Float Studies | 12 | 8 | 2,304 | $11,646 | 10 | 27 | $7,826 | | | 35 | $8,699 | $304,463 | |
| 8 | Open Ocean Bio/Chem Int. | 12 | 2 | 576 | $11,646 | 6 | 26 | $3,082 | | | 28 | $3,694 | $103,435 | |
| 9 | Laying Cable for Observ. | 12 | 5 | 1,440 | $11,646 | 5 | 5 | $2,480 | 10 | $2,887 | 20 | $4,975 | $99,505 | |
| 10 | Moving Ship Tomography | 12 | 15 | 4,320 | $11,646 | | | | 15 | $2,887 | 30 | $7,267 | $218,005 | |
| | | | 61 | | | | 108 | | 78 | | 247 | $6,533 | | $1,960,049 |

# OCEAN Class AGOR
# Concept Definition

# Operating Cost Calculation

| | Avg Expenses Global Class 98/99 $ (from ONR) | Global Class Escalated to '04$ | Ratio By | Monohull | SWATH | X Craft, Prop | X Craft, WJ |
|---|---|---|---|---|---|---|---|
| ***Year $*** | 1998.5 | 2004 | | | | | |
| | | | | | | | |
| ***Payroll*** | | | | | | | |
| Salaries, ship | $1,729,043 | $2,034,279 | Crew Size | $2,034,279 | $2,034,279 | $2,034,279 | $2,034,279 |
| Salaries, shore | $247,965 | $291,739 | Unity | $291,739 | $291,739 | $291,739 | $291,739 |
| ***Payroll Subtotal*** | ***$1,977,007*** | ***$2,326,018*** | | ***$2,326,018*** | ***$2,326,018*** | ***$2,326,018*** | ***$2,326,018*** |
| | | | | | | | |
| ***Maintenance*** | | | | | | | |
| Repairs & Maintenance | $283,377 | $333,403 | Vessel Displ [1] | $260,471 | $276,099 | $250,052 | $250,052 |
| Major Overhaul | $333,199 | $392,020 | Vessel Displ [2] | $306,266 | $324,642 | $294,015 | $294,015 |
| ***Maint Subtotal*** | ***$616,576*** | ***$725,423*** | | ***$566,737*** | ***$600,741*** | ***$544,067*** | ***$544,067*** |
| | | | | | | | |
| ***Other Costs*** | | | | | | | |
| Fuel, lube | $562,800 | $662,153 | Calculated | $866,243 | $1,104,011 | $1,374,110 | $1,960,049 |
| Food | $95,177 | $111,979 | Complement | $111,979 | $111,979 | $111,979 | $111,979 |
| Insurance | $66,984 | $78,809 | Vessel Displ | $61,569 | $65,263 | $59,107 | $59,107 |
| Stores | $215,998 | $254,129 | Complement | $254,129 | $254,129 | $254,129 | $254,129 |
| Travel | $100,143 | $117,822 | Crew Size | $117,822 | $117,822 | $117,822 | $117,822 |
| Shore Facility | $105,872 | $124,562 | Vessel Displ | $97,314 | $103,153 | $93,422 | $93,422 |
| Misc | $167,894 | $197,533 | Vessel Displ | $154,323 | $163,582 | $148,150 | $148,150 |
| Indirect Costs | $460,975 | $542,352 | Vessel Displ | $423,713 | $449,136 | $406,764 | $406,764 |
| ***Other Subtotal*** | ***$1,775,843*** | ***$2,089,340*** | | ***$2,087,092*** | ***$2,369,076*** | ***$2,565,483*** | ***$3,151,422*** |
| | | | | | | | |
| ***Total Annual Ship Cost*** | ***$4,369,426*** | ***$5,140,781*** | | ***$4,979,847*** | ***$5,295,834*** | ***$5,435,567*** | ***$6,021,506*** |
| | | | | | | | |
| Operating Days | 272.75 | 272 | | 300 | 300 | 300 | 300 |
| | | | | | | | |
| ***Day Rate*** | ***$16,019.89*** | ***$18,899.93*** | | ***$16,599.49*** | ***$17,652.78*** | ***$18,118.56*** | ***$20,071.69*** |
| | | | | | | | |
| Tech Support Costs | $4,000 | $4,706 | Unity | $4,706 | $4,706 | $4,706 | $4,706 |
| | | | | | | | |

# *Concept Design Capabilities Matrix*

# OCEAN Class AGOR

## Concept Definition

## Concept Design Capabilities

| | <----------SMRs----------> | | <----------OCEAN Class AGOR Variants----------> | | | | |
|---|---|---|---|---|---|---|---|
| | ***Minimum*** | ***Desired*** | ***Monohull*** | ***SWATH (AGOR 26)*** | ***X Craft AGOR*** | **AGOR 23/24 Class** | **AGOR 14/15 Class** |
| ***Seakeeping:*** | | | | | | | |
| Seakeeping performance | SS6 | SS6 | SS6 | SS6 | tbd | SS6 | SS6 |
| ***Ship Dimensions:*** | | | | | | | |
| Length between perp, ft | | | 210 | 172 | 240 | 254 | 250 |
| Beam, ft | | | 46 | 88 | 72 | 52.5 | 46 |
| Depth to Main Deck, ft | | | 24.9 | 38 | tbd | | |
| Draft, ft | | 19 | 16.9 | 25 | 14.6 | 17 to 19 | 16.5 |
| Finished Deck Ht (ft) | 7.5 | 8 | 8 | | tbd | | |
| Displacement, long tons | | | 2500 | 2542 | 2310 | 3400 | 2944 |
| ***Propulsion:*** | | | | | | | |
| Plant type | Integrated Diesel Electric | Integrated Diesel Electric | Integrated Diesel Electric | Integrated Diesel Electric | Integrated Diesel Electric | Split Bus Diesel Electric | Integrated Diesel Electric |
| # Screws | | | 2 | 2 | 2 | 2 | 2 |
| Total SHP | | | 4,000 | 4,000 | 6,000 | 6,000 | 2,800 |
| Speed, sustained | | 12 | 11 | 15 | tbd | 12 | 11.7 |
| Speed, maximum | | 14-15 | 15 | 15.5 | 15 | 15 | 14 |
| Speed, survey | | 12 | 12 | 12 | tbd | 12 | 11.7 |
| Towing Requirement | 10000@6, 25000@4 | 10000@6, 25000@4 | 10000@6, 25000@4 | 10000@6, 25000@4 | 10000@6, 25000@4 | | |
| Endurance Requirement | 8000 nm @ opt spd, 20 days transit, 20 days station | 10800 nm @ 12 kts, 20 days transit, 20 days station, or 30 days survey | 10800 nm @ 12 kts, 20 days transit, 20 days station, or 30 days survey | 10,000 nm at 11 kts | tbd | 15,000 nm at 12 kts, 52 days | 10,061 nm @ 11.7 kts, 40 days |
| Bow Thruster | Yes | Yes | 900 HP | 1100 HP | tbd | 1117 hp Elliott | 900 HP Retract |

# OCEAN Class AGOR

## Concept Definition

## Concept Design Capabilities

| | <----------SMRs----------> | | <----------OCEAN Class AGOR Variants----------> | | | | |
|---|---|---|---|---|---|---|---|
| | *Minimum* | *Desired* | *Monohull* | *SWATH* | *X Craft AGOR* | *AGOR 23/24 Class* | *AGOR 14/15 Class* |
| ***Accommodations:*** | | | | | | | |
| Crew | | USCG | 21 est. | 21 est. | 21 est. | 21 | 21 |
| **Scientists** | 20 | 25+ | 25+ | 25 | 25 | 37 | 38 |
| Total | | 43 | 43 | 46 | 46 | 58 | 59 |
| ***Certifications:*** | | | | | | | |
| ABS | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| USCG | Subchap U | Subchap U | Subchap U | Subchap U | Subchap U | Subchap U | Subchap U |
| Ice Class | A0 | A0 | A0 | D0 | tbd | C | C |
| ***Space and Payload:*** | | | | | | | |
| Total Lab Space, sq ft | 1,800 | 2,000 | 2,000 | 2,000 | 2,100 | 4,000 | 2,636 |
| Main Lab | 1,000 | 1000+ | 1,200 | | | | |
| Wet Lab | 400 | 400+ | 415 | 330 | | | |
| Computer Lab | 300 | 300+ | 300 | 830 | | | |
| Climate Contrl'd Work Area | 100 | 100+ | 115 | No | | | |
| Refrigerator/Freezer Space | 100 | 100 | 100 | No | | | |
| Number of Labs | 4 | 4 | 4 | | | | |
| Electronics Repair Shop | Yes | Yes | Yes | Yes | | | |
| IT Equipment Space | No | Yes | Yes | Yes | | | |
| IT Storage | Yes | Yes | Yes | Yes | | | |
| ISO Vans | 2 | 2 | 2 | 2 | | | |
| Vans (Non ISO, 500ft ttl) | | 2 | 2 | 2 | | | |
| Working Deck Space, sq ft | 2,000 | 2,000 | 2,000 | 2,000 | 2,050 | 4,070 | 4,050 |
| Clear Working Deck, sq ft | 1,500 | 1,500 | 1,500 | 1,500 | | | |
| Clear Rail Deck, sq ft | 80' x 8' | 80' x 8' | 80' x 8' | Transverse | | | |
| Mission storage, cu ft | | 5,000 | 5,000 | 15,000 | | | |
| Mission payload, long tons | 100 | 200 | 200 | 100 | 100 | | |
| High Bay | Yes | Yes | Yes | Yes | | | |

# OCEAN Class AGOR

## Concept Definition

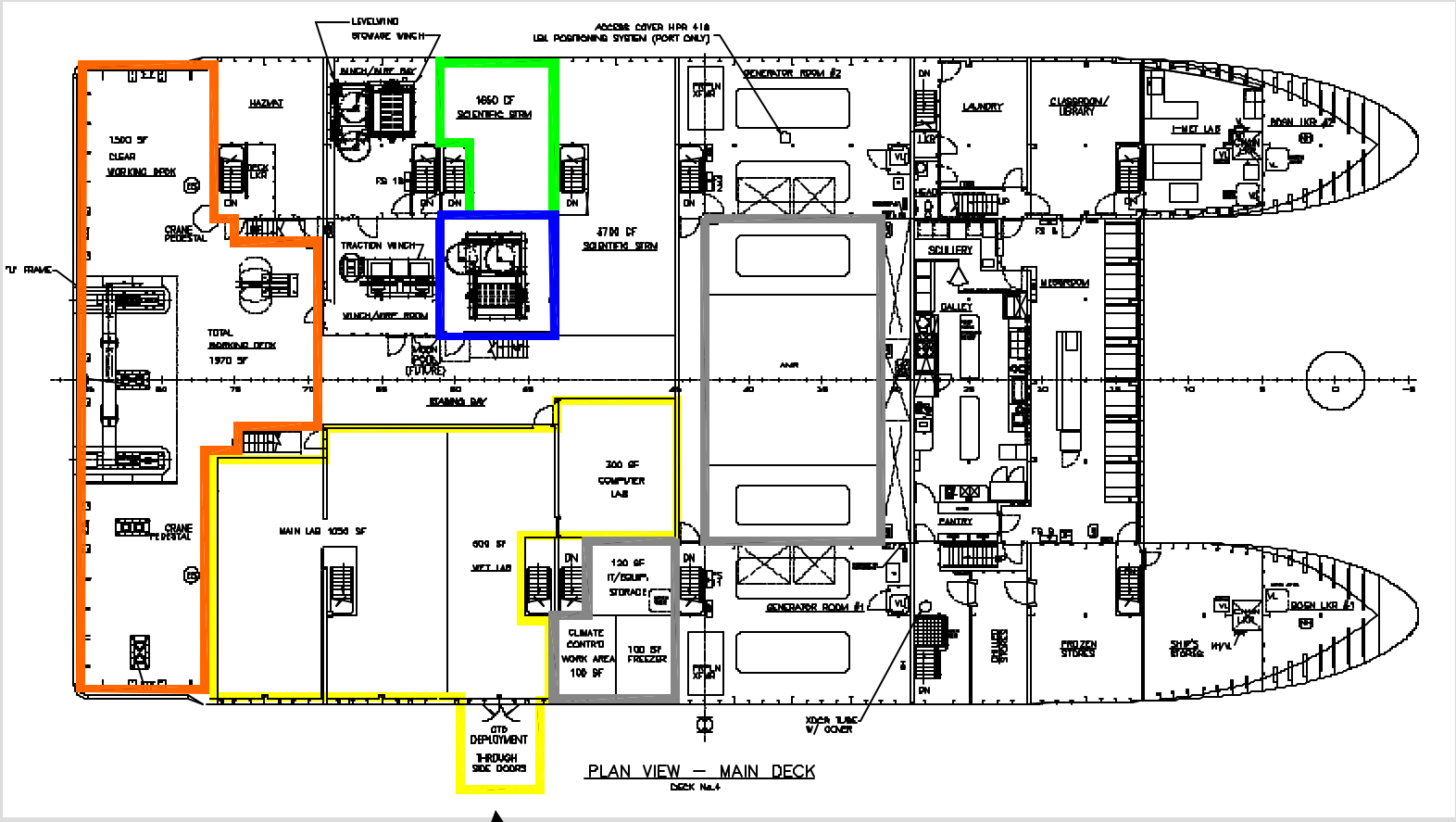
## Concept Design Capabilities

| | <----------SMRs----------> | | <----------OCEAN Class AGOR Variants----------> | | | | |
|---|---|---|---|---|---|---|---|
| | ***Minimum*** | ***Desired*** | ***Monohull*** | ***SWATH*** | ***X Craft AGOR*** | ***AGOR 23/24 Class*** | ***AGOR 14/15 Class*** |
| ***Mission Electronics Systems:*** | | | | | | | |
| Dynamic Positioning | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Deep multibeam | 1 deg | 1 deg | 1 deg | (1x2 deg) | (1x2 deg) | 2 deg | 2 deg |
| Shallow multibeam | data to 50m | data to 50m | Yes | Yes | Yes | No | No |
| Single beam echosounder | 12kHz | 12kHz | 12kHz | 12kHz | 12kHz | 12kHz | 12kHz |
| Subbottom profiler | 2-8kHz | 2-8kHz | 2-8kHz | Yes | Yes | 3.5kHz | 3.5kHz |
| ADCP | 38,75,150kHz | 38,75,150kHz | 38,75,150kHz | 38,75,150kHz | 38,75,150kHz | 150kHz | 150kHz |
| Acoustic positioning | Yes | Yes | Yes | Yes | Yes | Yes | |
| ***Handling Systems:*** | | | | | | | |
| Stern U frame | 30000# 15'Hx25'Vx12'O | 30000# 15'Hx25'Vx12'O | 30000# 15'Hx25'Vx12'O | 30000# 18'Hx25'Vx12'O | 30000# 18'Hx25'Vx12'O | 18000# | 20000# |
| Towing crane | | | | Yes | Yes | No | No |
| Boom cranes | 10000# @12' | 20000# @20' | 20000# @20' | 20000# @20' | 20000# @20' | Two | Two |
| Traction winch | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Hydrographic winch | 2 | 2 | 2 | 2 | 2 | 2 | 3 |
| Scientific Workboat | 25'-30' LOA | 25'-30' LOA | Yes | Yes | Yes | | |
| Inflatable Work Boat | 1 (16') | 1 (16') | 1 (16') | Yes | Yes | Yes | Yes |

# *Concept Design General Arrangements*

# OCEAN Class AGOR
# Concept Definition

## SWATH Arrangement Update

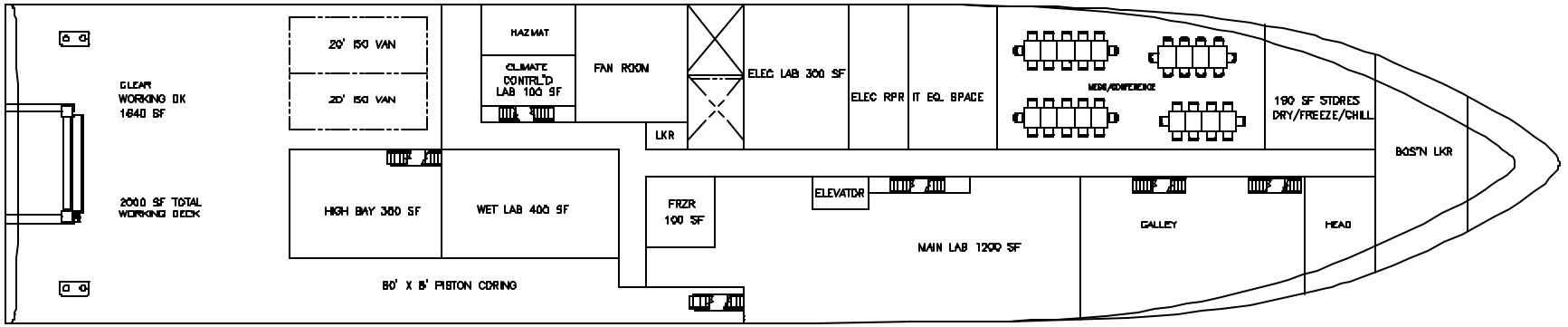



Wet Lab Relocated to Midship With Overside Deployment

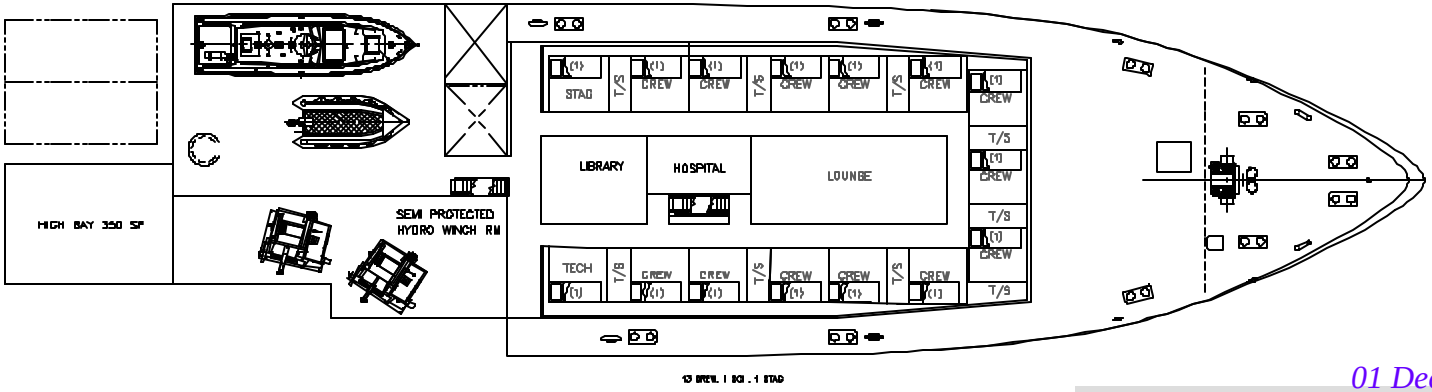
# OCEAN Class AGOR
# Concept Definition

## Monohull Arrangement Update

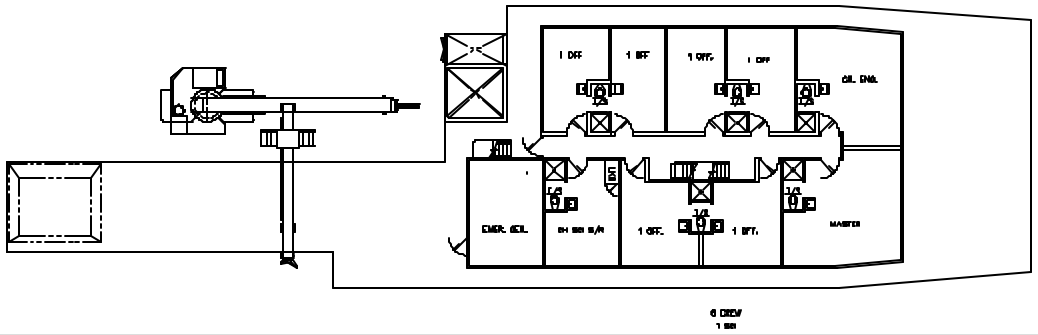
- Single SRs Throughout, Single Lounge, No Ch. Sci Day Room




*Main Deck*




*01 Deck*

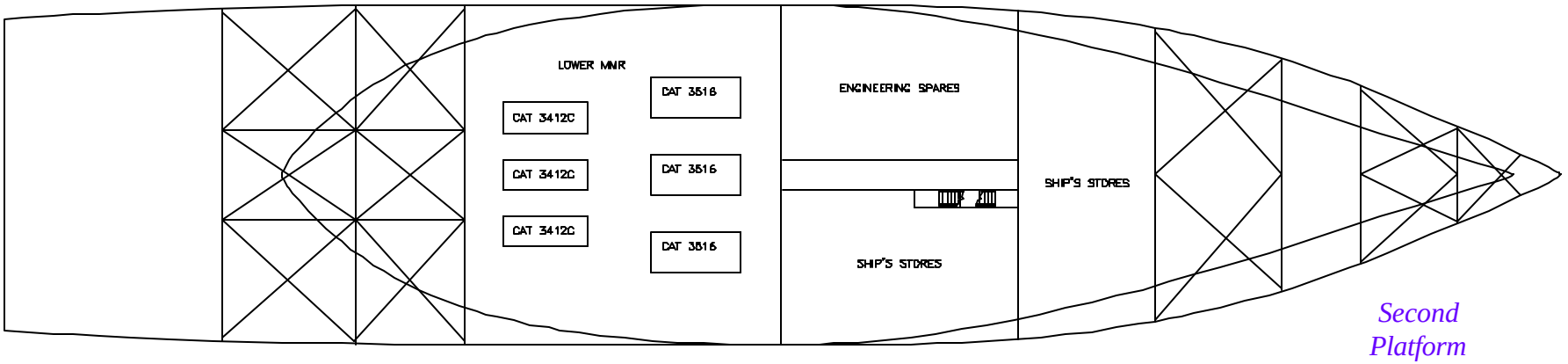



*02 Deck*

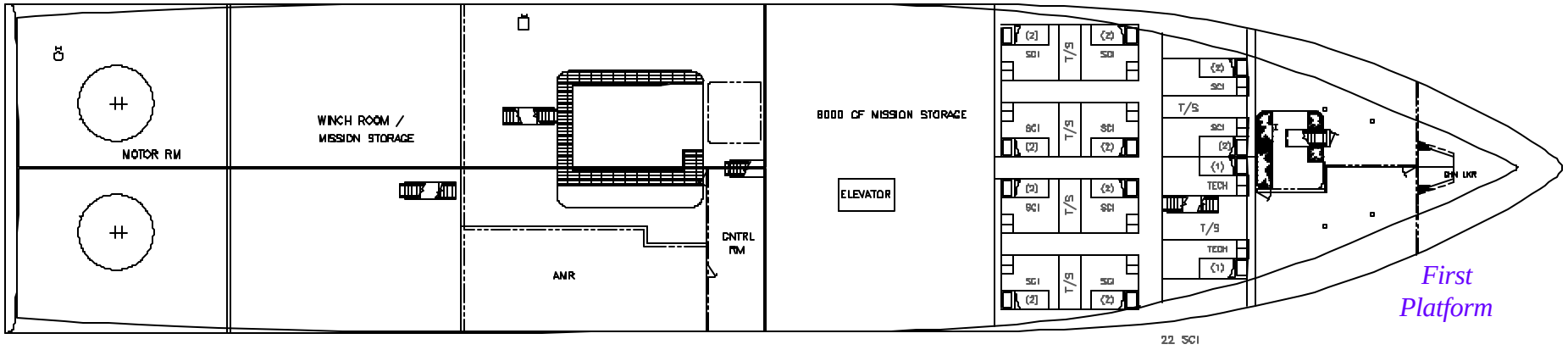
# OCEAN Class AGOR Concept Definition

## Monohull Arrangement Update

- Single SRs Throughout, Single Lounge, No Ch. Sci Day Room, Elevator




*Second Platform*



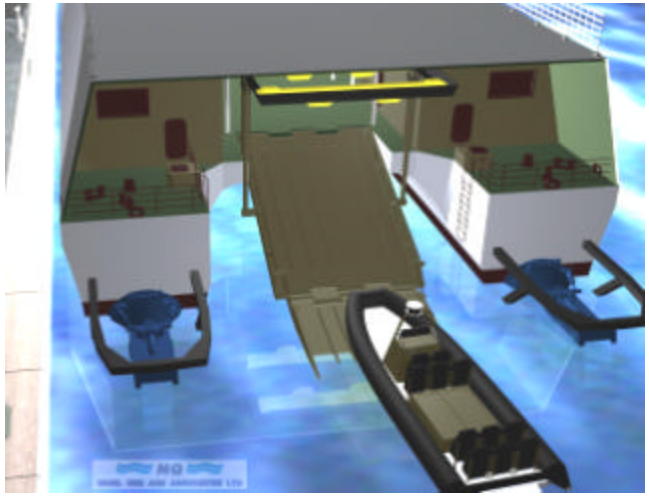

*First Platform*

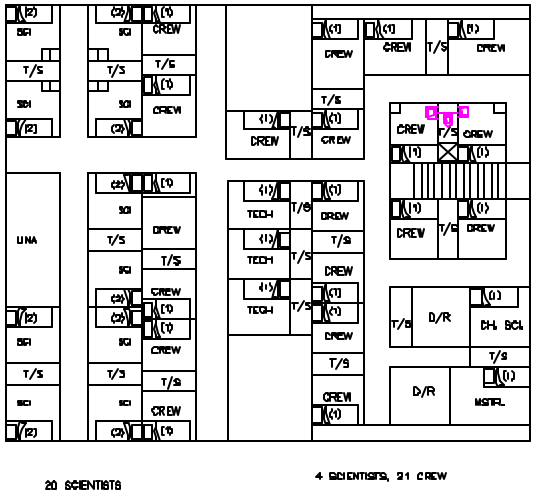
# OCEAN Class AGOR
# Concept Definition

## X Craft Arrangement Update

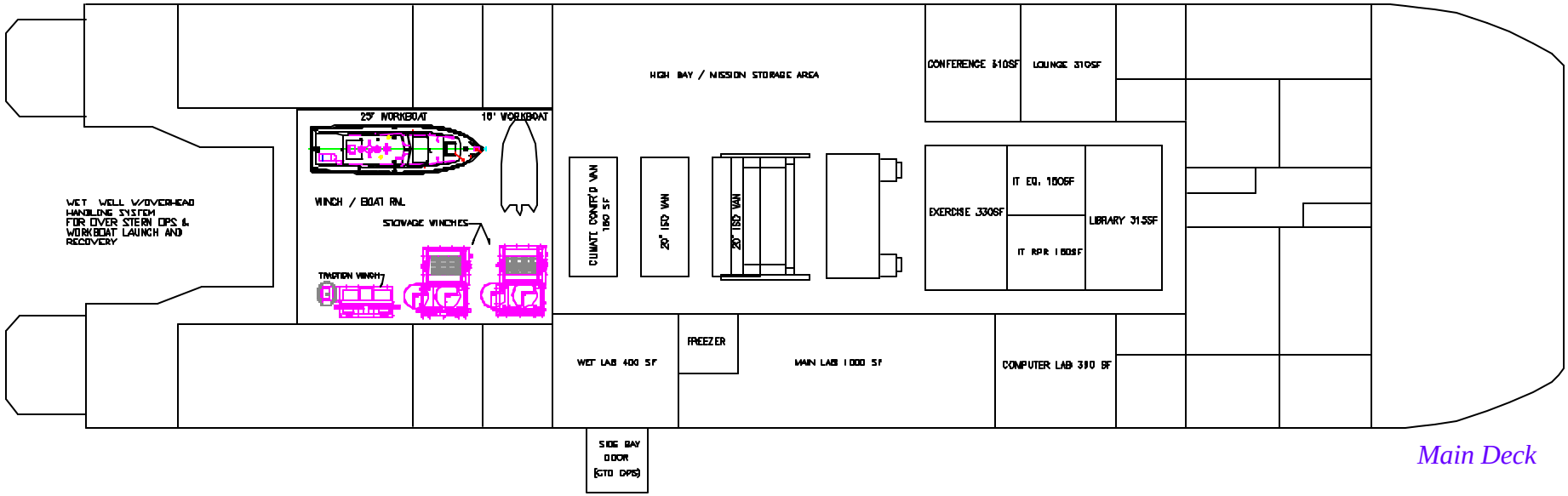
- Arrangement Modified to Retain more of the Original X Craft Characteristics

View of X Craft Stern Showing Stern Well and Ramp






*01 Deck*




*Main Deck*