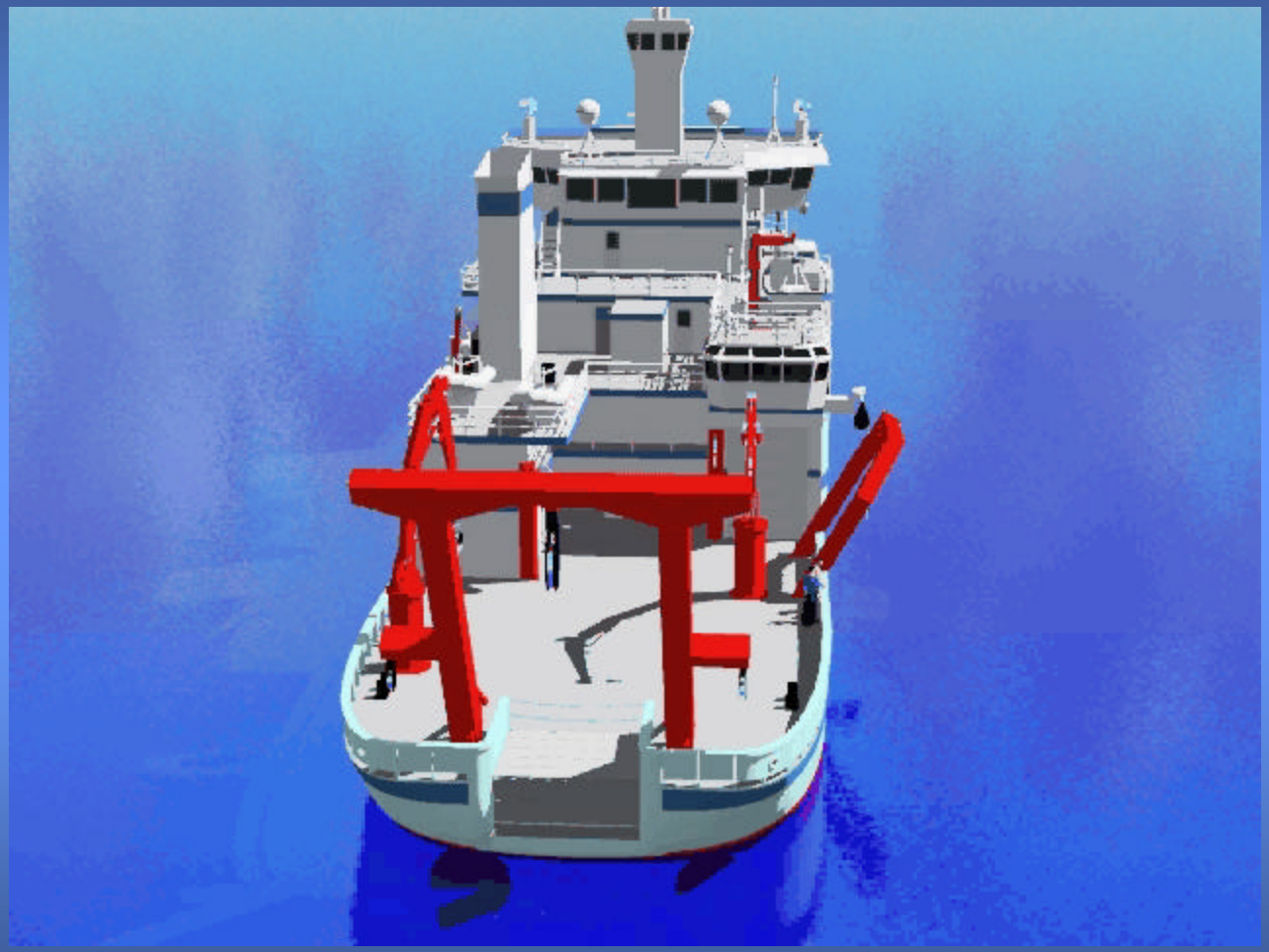
ALASKA REGION RESEARCH VESSEL (ARRV)

FIC/UNOLS Council

60% Contract Design Report

10 March 2004

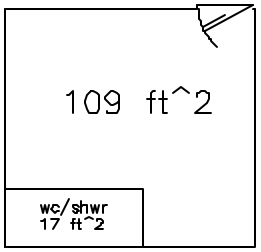
www.sfos.uaf.edu/arrv



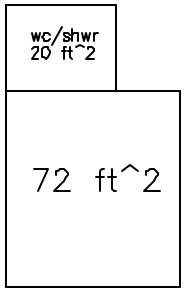
Alaska Region Research Vessel

- Project Status
- Ice Classification
- Over-the-side Handling
- Science Outfit / Instrumentation Work Groups
- Supplemental Request Comments

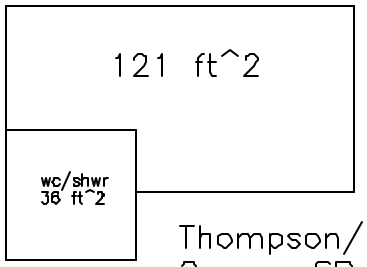
Stateroom Size



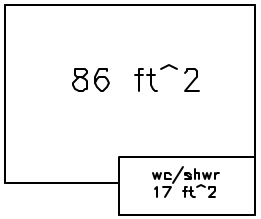
ARRV – January 2004
2 CREW pers SR



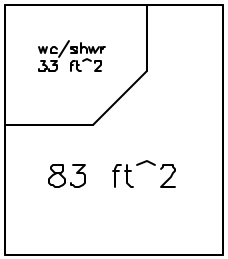
Wecoma/Oceanus
2 pers SR



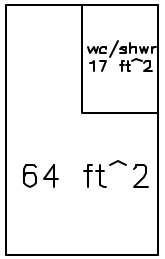
Thompson/Revelle/Atlantis
2 pers SR



ARRV – January 2004
2 SCIENCE pers SR

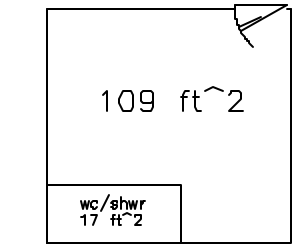


M/V Laurence M. Gould
2 pers SR

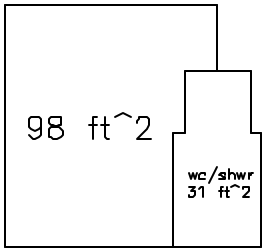


M/V Nathaniel Palmer
2 pers SR

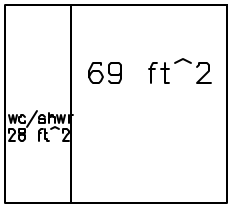
Stateroom Size



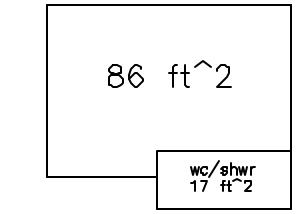
ARRV – January 2004
2 CREW pers SR



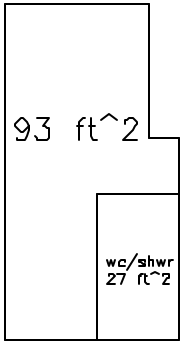
R/V Knorr
2 pers SR



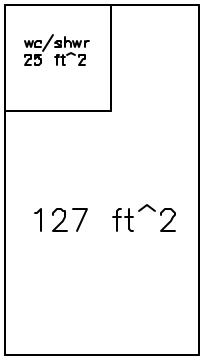
MBARI Western Flyer
2 pers SR (small)



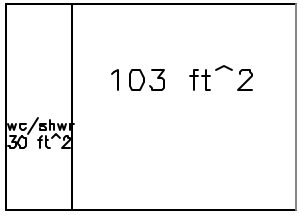
ARRV – January 2004
2 SCIENCE pers SR



R/V Scotia
1 pers SR



NOAA FRV–40
2 pers SR



MBARI Western Flyer
2 pers SR (large)

Project Status

- 9 Dec 03 meeting action items
  - Weight estimate
  - ABS ice class achievable with current plate thickness and no half-frames
  - Weight impact of going to ABS A1
  - Ice-going vessel with side seachest

Weight Estimate

	Weight [LT]	VCG [ft ABL]	LCG [ft aft FP]
Preliminary Design Lightship	2349	24.9	102.3
Current Lightship Estimate			
Increase due to plate thickness for longer vessel.			

Impact of ABS A1 Ice Class

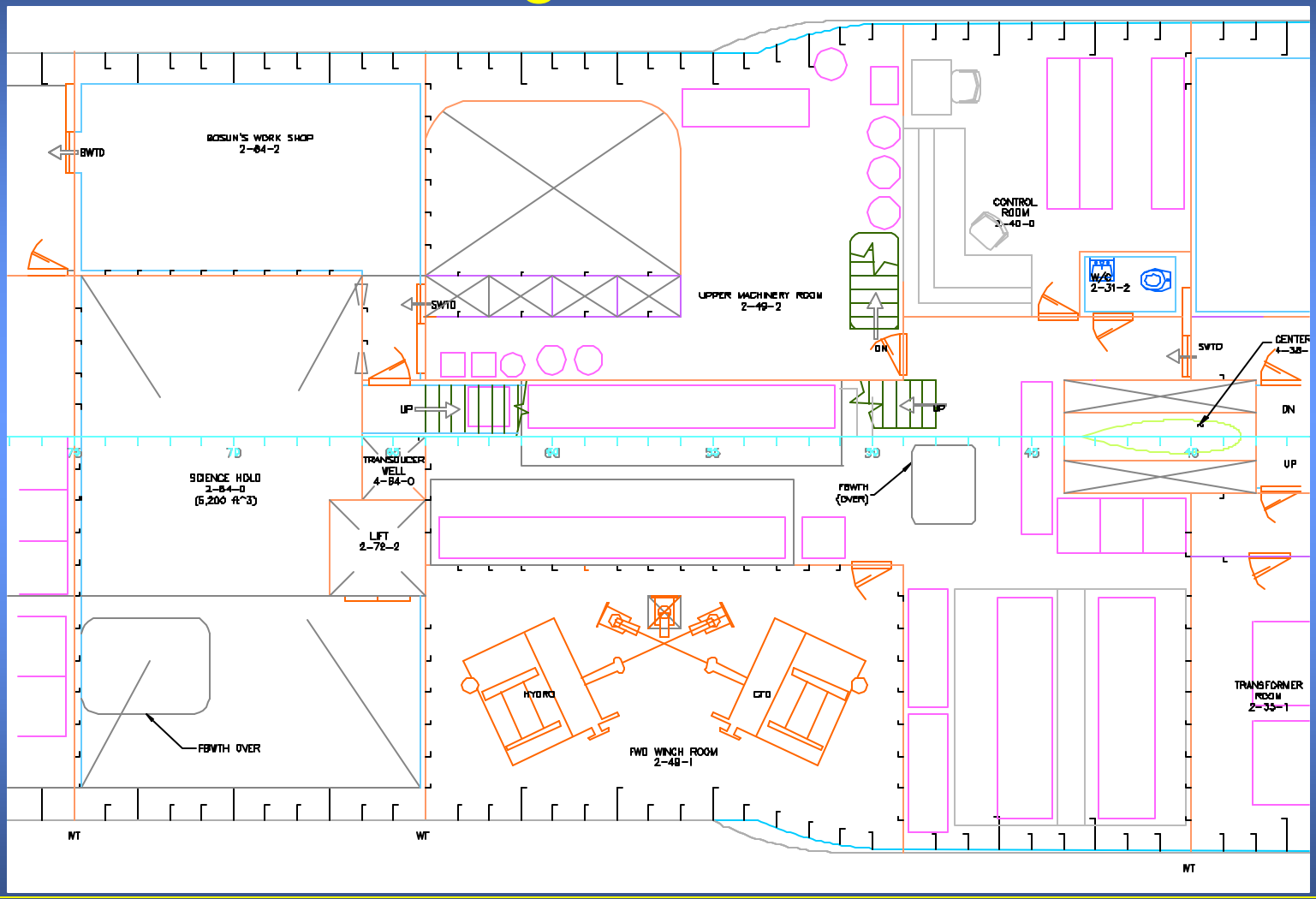
- Add plate thickness → 42.9 LT
  or
  Add half-frames → 49.4 LT

- 8–9% decrease in fuel capacity

Project Status

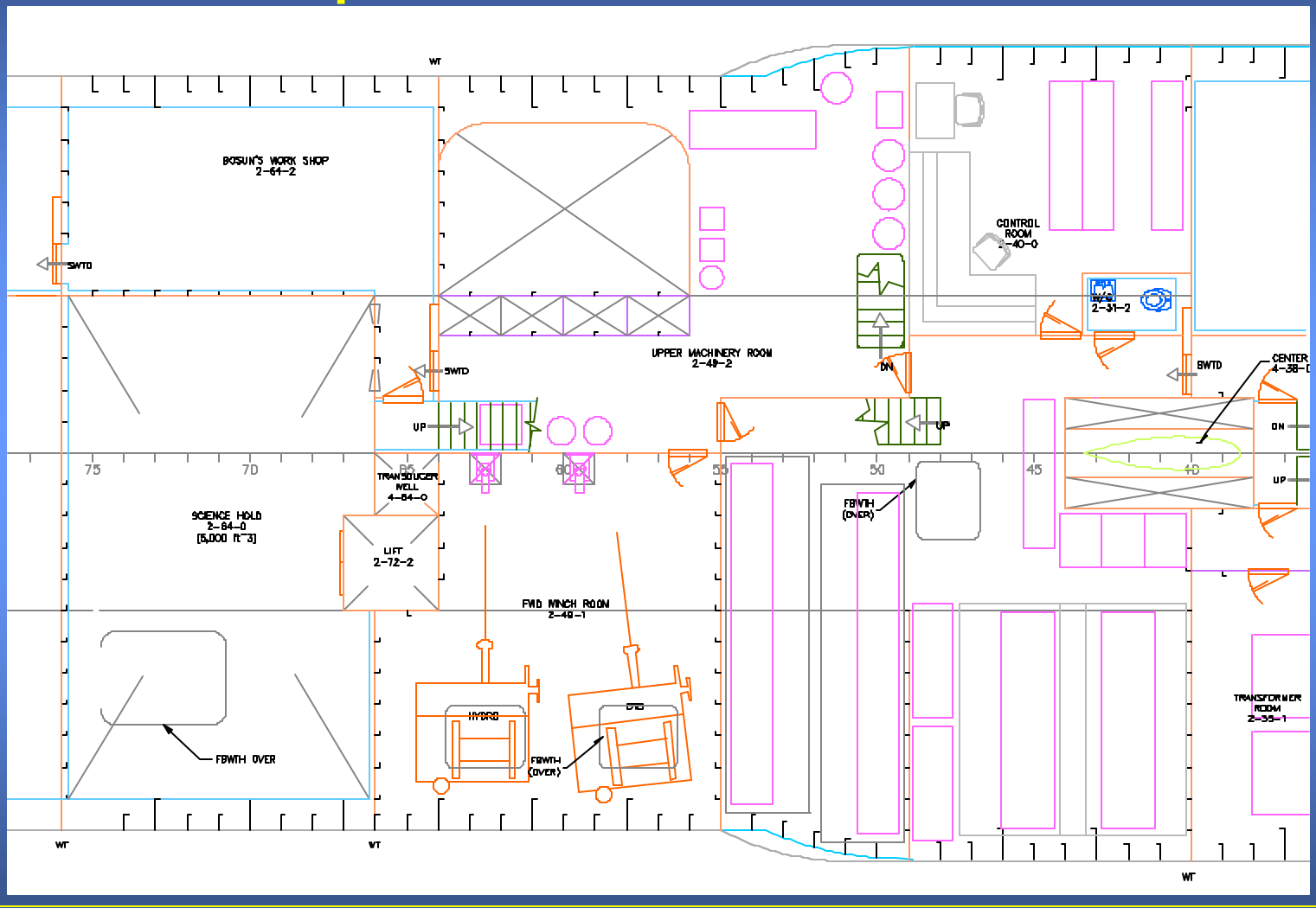
- General Arrangement Changes
  - Winch room arrangement
  - Shift science hold bulkhead to maintain SMR volume
  - Moved SWTD inboard of side damage extent

Existing Winch Room



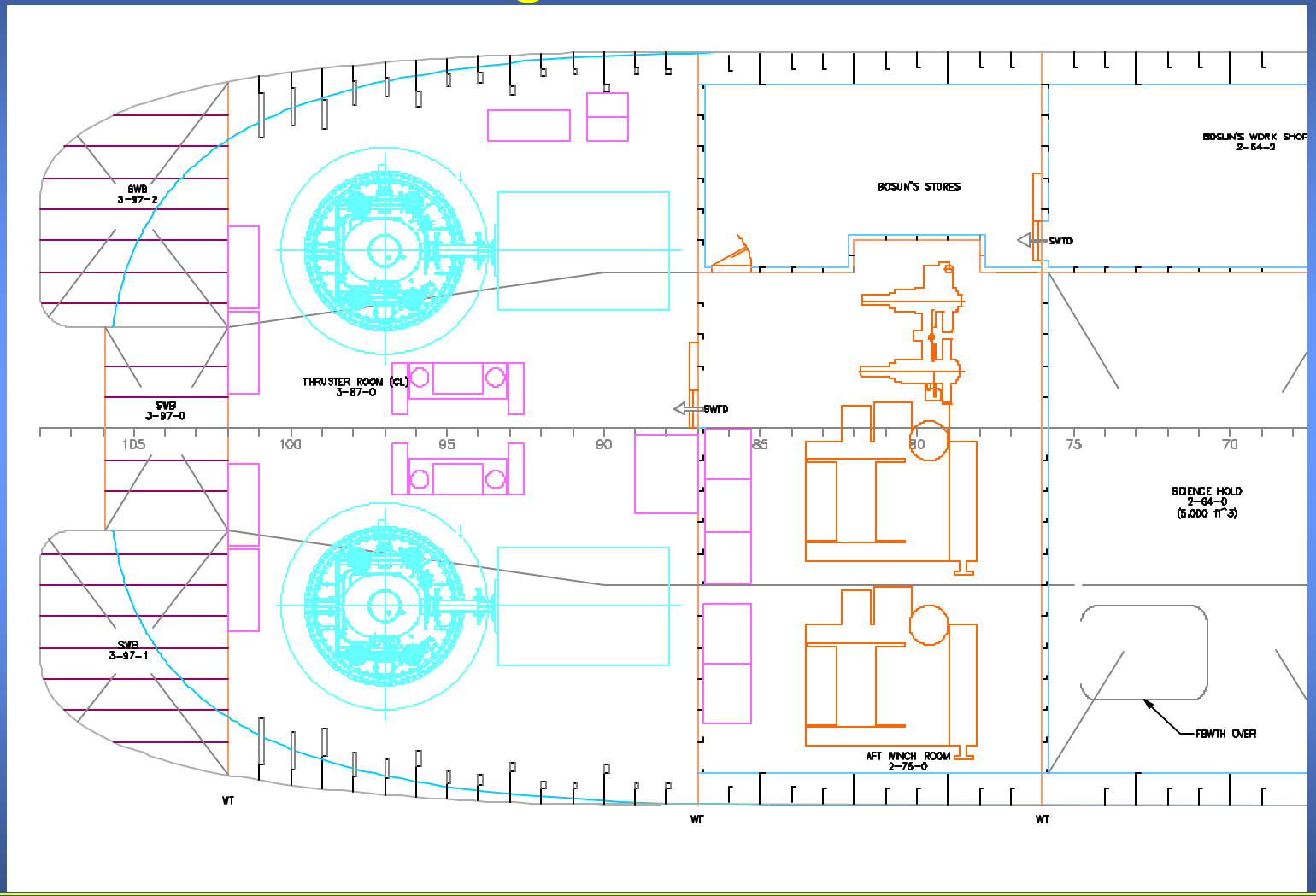
Alaska Region Research Vessel

Proposed Winch Room



Alaska Region Research Vessel

Sliding WT Doors



Structural Design

- Scantlings defined for PC5
- Preliminary drawings (60% complete)
- Ice Classification
  - UR completion uncertain
  - Continue monitoring IACS progress

Mechanical / Electrical Drawings

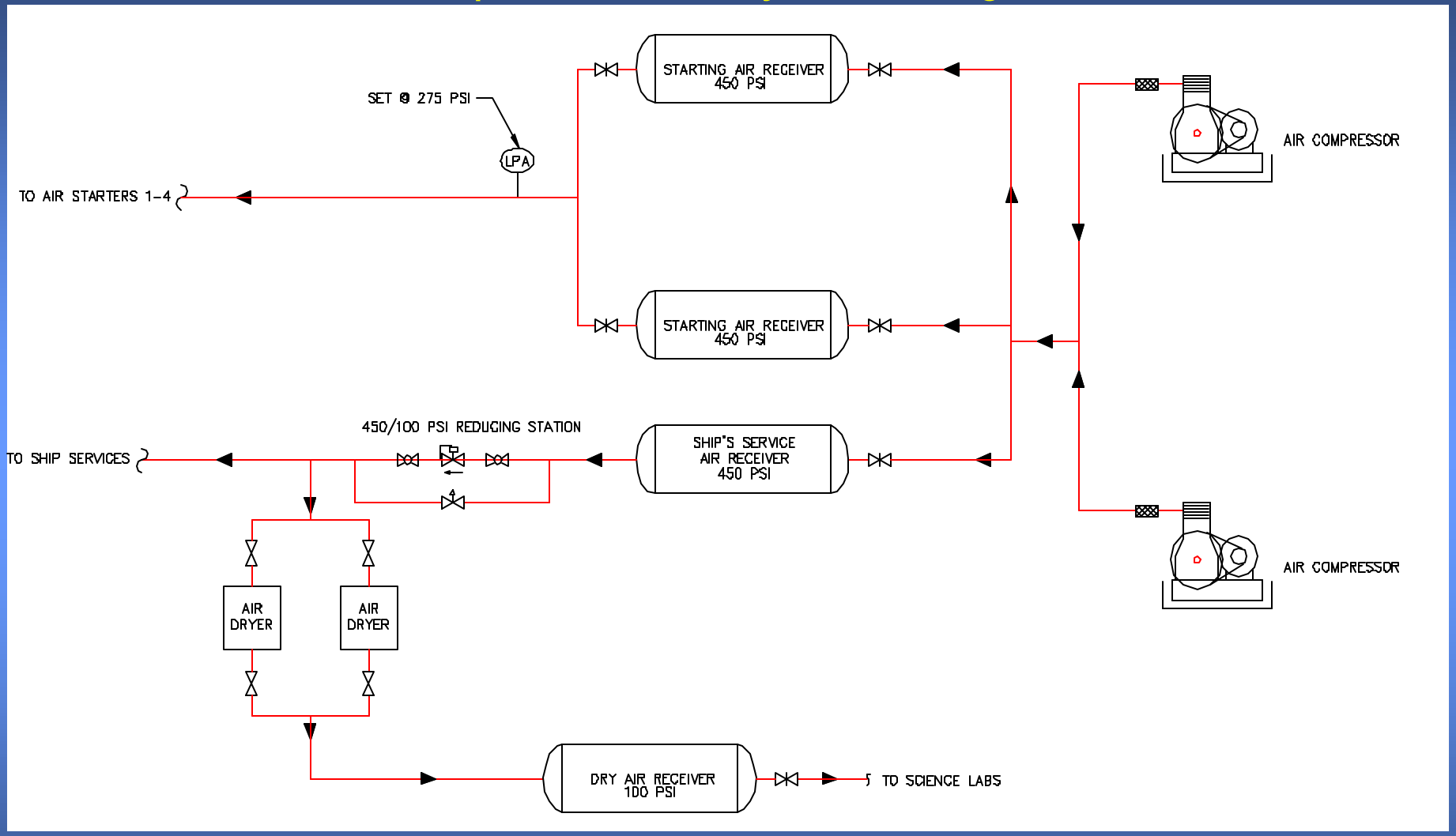
Preliminary System Drawings available on FTP site.

- Fuel Oil
- Lube Oil
- Bilge & Ballast
- Sanitary
- Firemain
- Potable Water
- Exhaust
- Sewage
- Compressed Air
- Electrical One-Line
- Fire Zone Plan
- Insulation Plan
- Chilled Water
- Steam & Condensate
- Lighting Layout

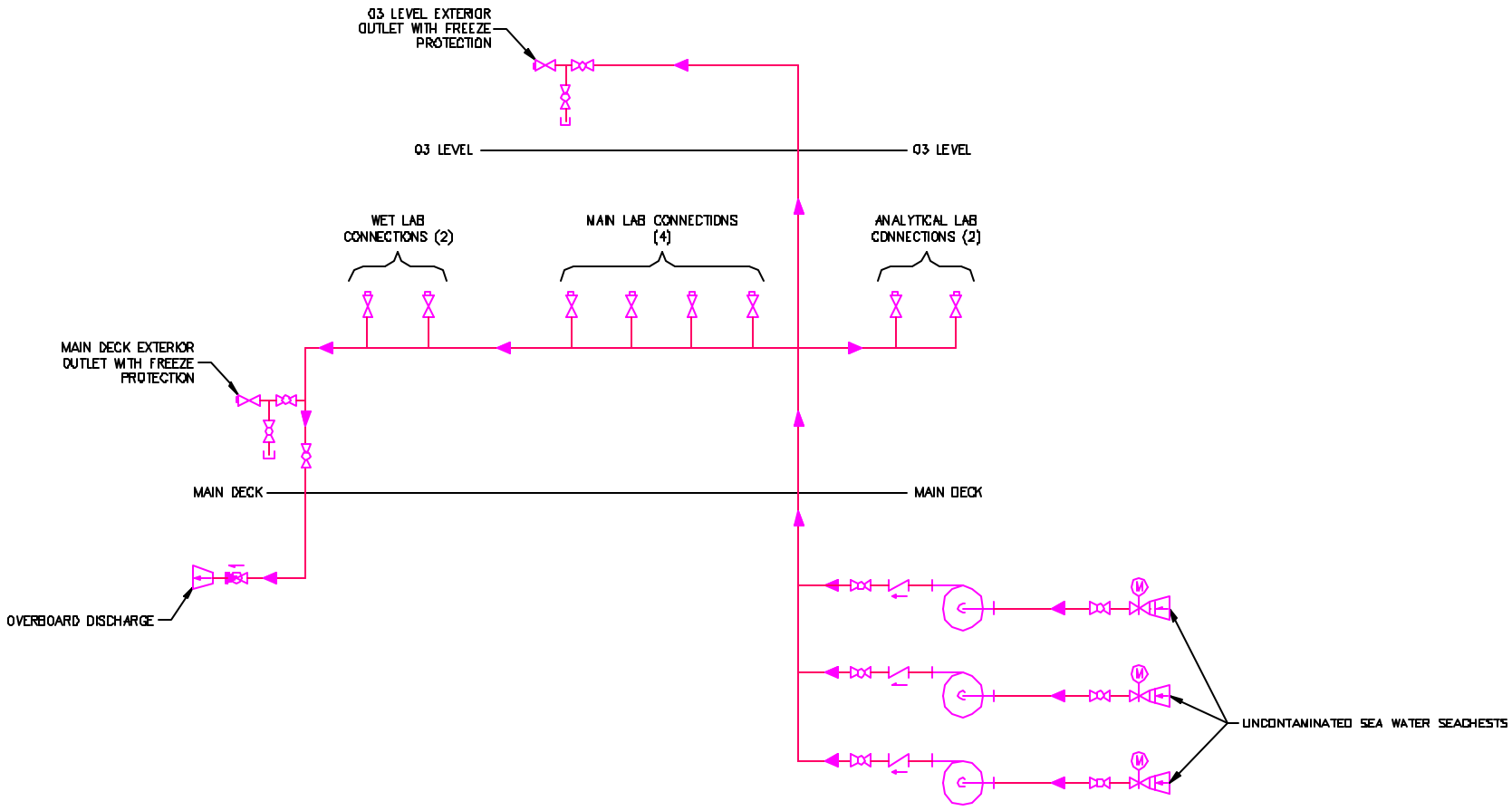
Compressed Air System

- 450 psi starting air
- Four air receivers (2 start air, 1 ship's service, 1 science)
- No Control Air System
- Proposed Science compressed air system consists of 100 psi dry air to labs.
- Need feedback on science air demands.

Compressed Air System Diagram

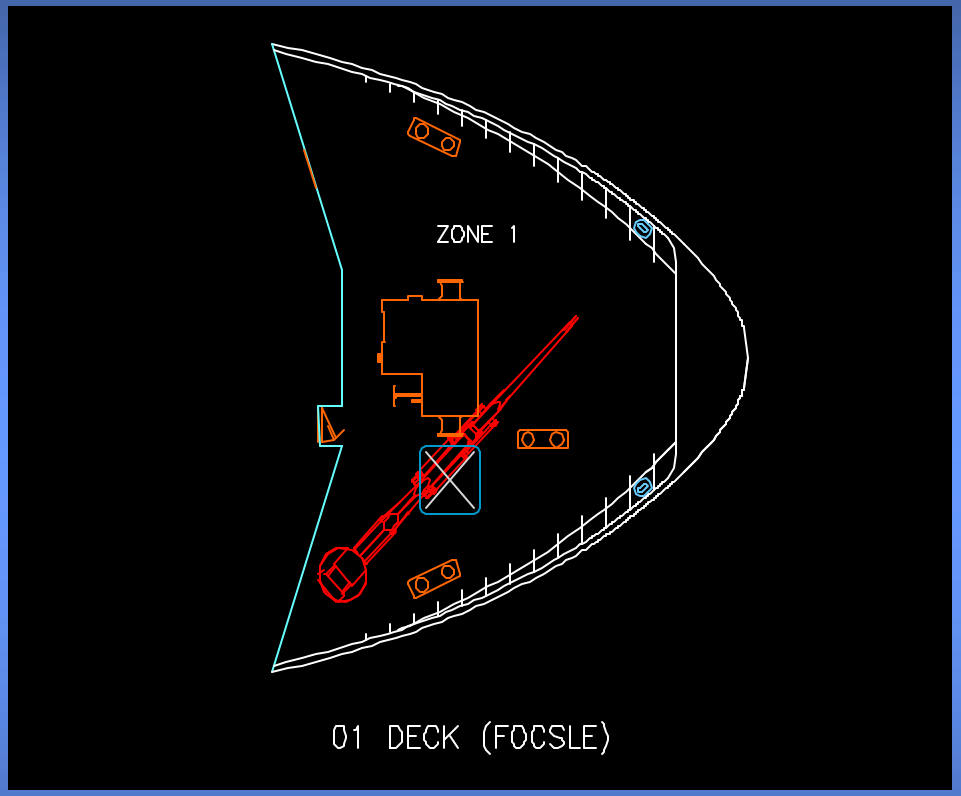


Uncontaminated Seawater System

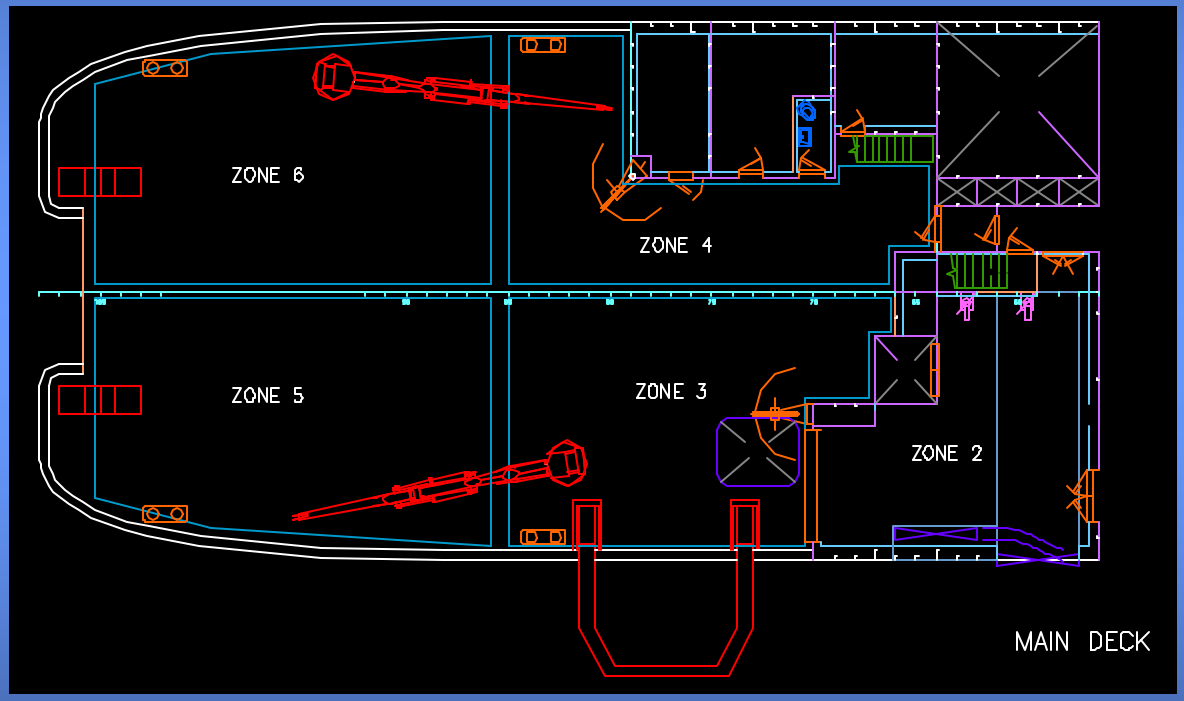


Deck Heating System

- System meets DNV DEICE power and time requirements (300 W/m^2 & 6-8 hr de-ice time)



Waste Heat System
Deck Heating Zones



- Six Deck Heating Zones (approx. 700-800 sq.ft.), including Baltic Room. Configure system to run more than one zone at the same time.
- Restrictions on system capabilities are derived from pump capacity not waste heat. (fewer zones will require longer pipe branches and more water flow for heat transfer)

Deck Heating System

- Sea bay 60 deg F (USCG Healy approach)
- Added weight ~7 long tons

Electric vs. Hydraulic Power

Hydraulic Power Advantages

- Flexibility – More Equipment running from one central HPU
- High torque at low speed

Disadvantages

- Poor Performance at low temperature
- Equipment operation noise
- Maintenance
- System design must interface with multiple pieces of machinery
- Fire Hazard / Safety risk of high pressure piping
- Requires centralized space for HPU installation (large)

Electric vs. Hydraulic Power

Electric Power Advantages

- Machinery is vendor furnished, no interfacing
- Relatively quiet
- Low maintenance
- More efficient

Disadvantages

- Feedback from machinery requires filtration
- Increased electrical load

Additional Machinery Plant Concerns

- Possible elimination of 208/220 Volt bus
- Seawater / Freshwater Cooling
  - Larger, centralized heat exchangers
  - More, smaller, system specific heat exchangers
- Generator selection
    - Detroit Diesel 16v4000 ←
    - Cat 3500 Series

Over-the-side Handling Gear

- Over-the-side handling study update
- U-frame design and location
- Large crane location
- Side A-frame versus articulating crane
- Electric winches vs. hydraulic
- Baltic room access and configuration

Science Outfit / Instrumentation Work Groups

- Underway biowater (also incubator and net/sed washing)
- RO/distilled water
- Benches, shelving, general equipment (refrig, hoods, sinks)
- Electric power/IT system/Video system
- Weather stations, meteorology and air sampling
- Surface underway science instruments and bottom sounder
- Multi-beam (deep and shallow systems)
- ADCP systems
- CTD/rosette system for hydro and productivity
- Plankton sampling/MOCNESS/acoustics/optical plankton counter

Uncontaminated Seawater System

- Current design consists of three, 200 gpm pumps.
- Three separate seachest locations (bow thruster room, centerboard well and MMR)
- Pipe material options (plastic lines, stainless)
- Demands for system (incubator size, number of connections in labs, etc.) being defined.

Science Outfit / Instrumentation Work Groups

- Fisheries Oceanography/acoustic assessment
- Bird and Mammal Observer Station
- Climate-controlled chambers, Deck Incubators
- Geological Sampling (grabs, cores, dredges)
- Egress to ice/small boats
- Lab vans (isotope, fish, general lab)
- ROV/AUV capable facilities (power, handling, hanger)
- Work boats, inflatables and personal water craft
- Mooring or array deployments gear
- Haz Mat, gas storage and safety systems
- ADA design needs for all science spaces (using CHRV, LDEO and cruise ship guidelines)

Additional Items

- Handicap access
- Microscope lab

Supplemental Request Comments

- Baltic room
  - dangerous in open ocean
  - door limits equipment size
- High-latitude specialization vs. Multi-use
- Design constrained
- Van capacity – 2-4? (with/without net reel)
- Complaints about Palmer stateroom size

Supplemental Request Comments

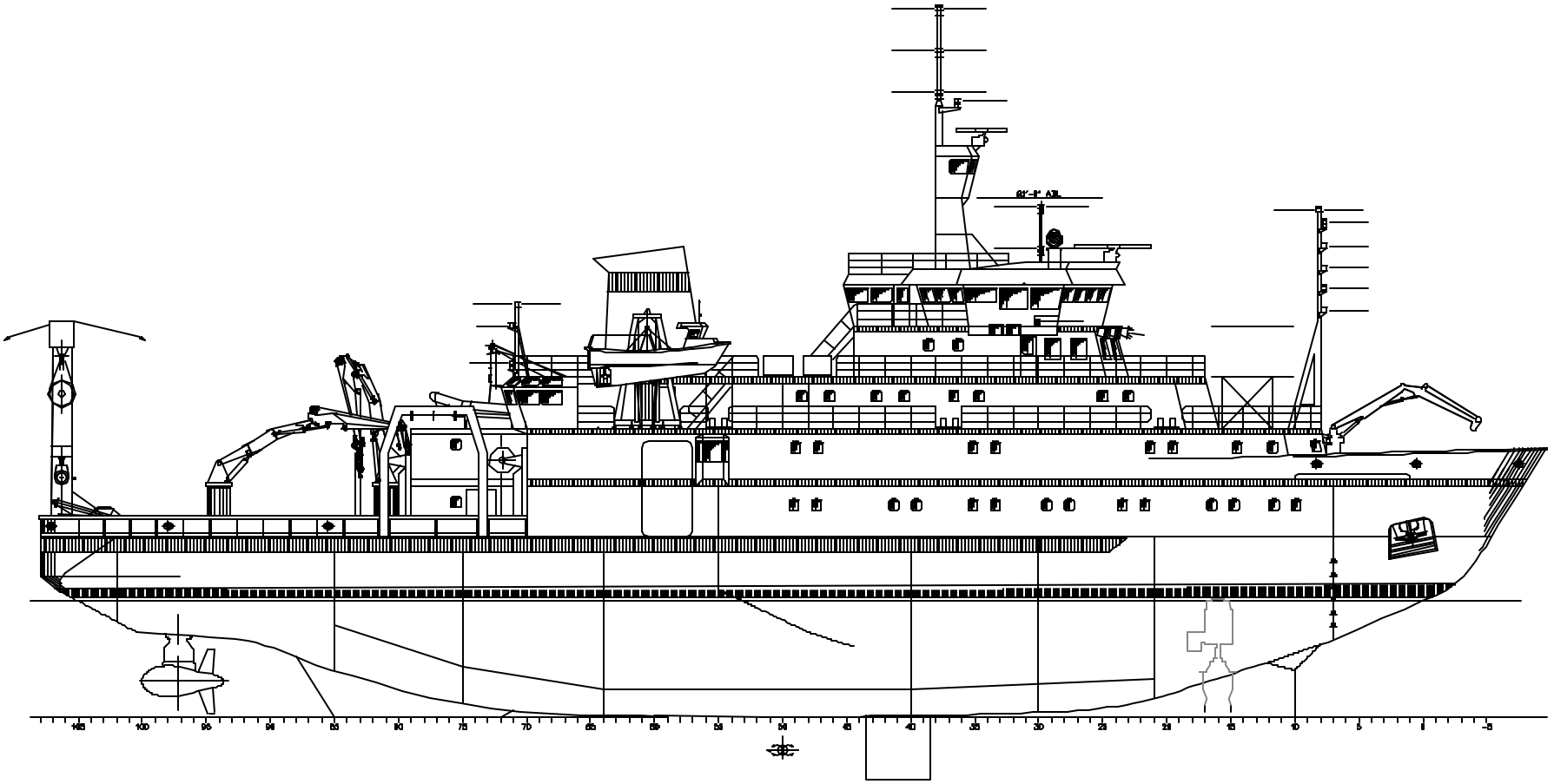
- Deck heating – does it work? adds weight
- Transducer mounting / seawater intake
  - ECO experience
  - ARVOC icebreaker design

Alaska Region Research Vessel

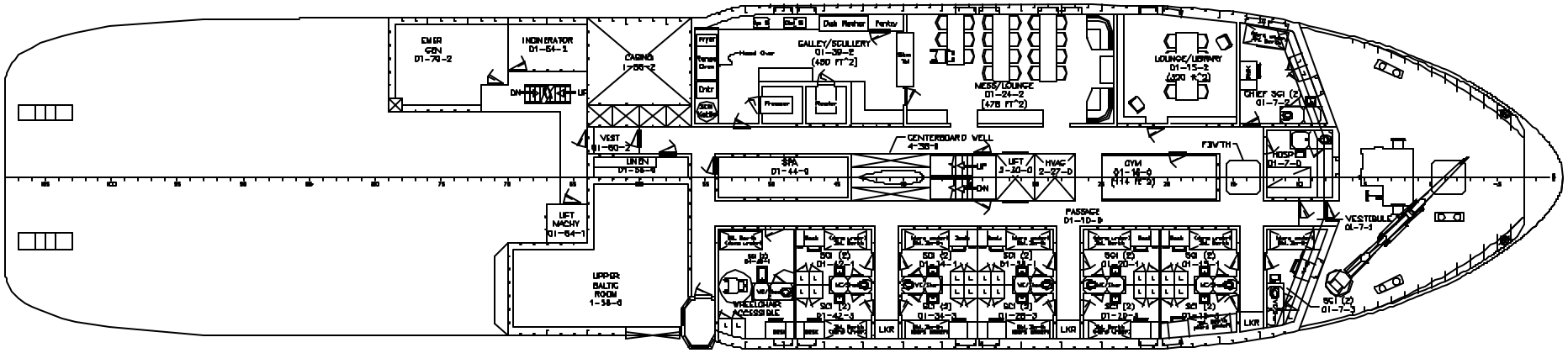
Science Outfit and Instrumentation Work Groups

Underway biowater (also incubator and net/sediment washing)	Whitledge
RO/distilled water	Whitledge
Benches, shelving, general equipment (refrig, hoods, sinks)	Hartz
Electric power/IT system/Video system	Hartz
Weather stations, meteorology and air sampling	Hartz
- Chris Van Alt	
Surface underway science instruments and bottom sounder	Hartz
Multi-beam (deep and shallow systems?)	Chayes
- Peter Lemmond – he participate in HEALY System tests with Dale	
ADCP	Weingartner/Pickart/Hebert
- Erik Firing or Jules Hummand	
CTD/rosette system for hydro and productivity	Weingartner/Pickart
Plankton sampling/MOCNESS/acoustics/optical plankton counter	Coyle/Hopcroft
- Peter Wiebe	
Geological sampling (grabs, corers, dredges)	Reynolds/Coakley/Grebmeier
Fisheries Oceanography sampling	Kruse
Fisheries acoustics assessment	Stouffer
- Jim Meehan (NOAA – he was involved with the FRV design)	
Bird and Mammal Observer Station	Hunt
Climate-controlled chambers	Hopcroft/Gradinger
Deck Incubators	Stockwell
Lab vans (isotope, fish, general lab)	Stockwell/Stouffer/Hartz
- Matt Hawkins – he is probably very busy right now, but would be a good contact	
ROV/AUV capable facilities (power, handling, hanger)	Reynolds/Hopcroft
- Andy Bowen – ROV	
- Dana Yoerger – AUV	
- Jim Bellingham – AUV (and HEALY experience)	
Work boats, inflatables and personel water craft	Elsner
Mooring or array deployments gear	Weingartner/Leech
- Trask or John Kemp	
Haz Mat, gas storage and safety systems	?
ADA design needs for all science spaces	Glover
- Paul Ljunggren or Al Walsh – they addressed this in EWING refit/replacement planning	
- Matt Hawkins	
- This is on the agenda at the FIC meeting	

Outboard Profile

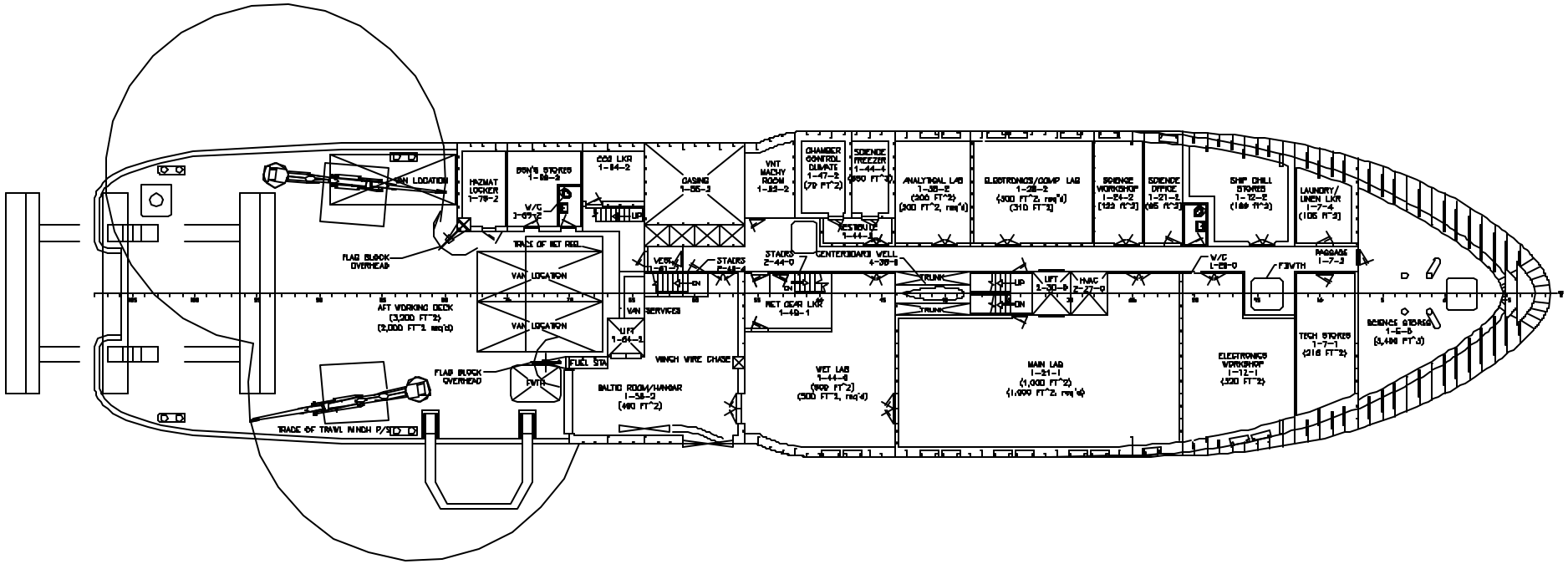


01 Deck



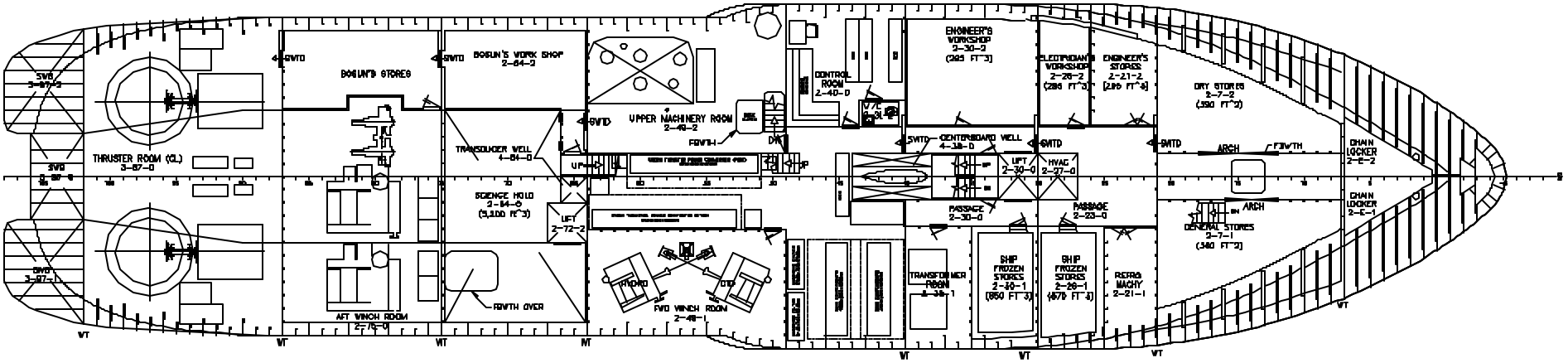
Alaska Region Research Vessel

Main Deck



Alaska Region Research Vessel

1st Platform



Alaska Region Research Vessel

2nd Platform