Healy Science Support

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Overview

- ✦AICC Ranking of science improvements
- ✦Multibeam Replacement
- ✦Science Communications
- ✦New TSG location
- ✦Proposed pCO_2 system
- ✦Environmentally controlled walk-ins
- ✦Lab Space renovation
- ✦New Met System
- ✦ADCP Changes
- ✦Gravity Meter
- ✦Equipment purchases
- ✦Update on equipment for 2008
- ✦Potential science-driven needs
- ✦Plans for 2009/2010 Drydock
- ✦Planning for Healy mid-life incremental refit

This is brief outline of the topics in this set of slides

AICC Ranking

(1 is highest)

Item	Relative COST	MEAN	StDev	N
New or upgraded Multibeam	$$$$	1	0	5
Support Existing Multibeam	$$	1	0	5
Convert dark room to lab	$	1	0	3
Seawater: pCO2	$$	1.2	0.4	5
Seawater: Definition of water needs	$	1.3	0.5	4
Broadband Hydrophone	$	1.3	0.6	3
Seawater: New TSG location	$$	1.5	0.5	6
Climate Chambers	$-$$	1.5	1	4
Communications: Science VSAT	$$$	1.6	0.5	6
ADCPs: Re-route cables	$	1.6	0.9	5
Computer Lab renovation	$	1.6	0.5	5
Aft Staging complete Unistrut	$	1.6	0.5	5
Communications: Science Inmarsat	$$	1.9	0.7	6
Aft Con renovation	$- $$	1.9	0.9	5
FO 0.68" wire on existing winch	$$$	2	1	5
Terascan: Return to smaller dish?	??	2	1	5
FO 0.68" wire with new winch	$$$$	2.2	1.1	5
Met Lab renovation	$	2.2	1	6
02 Copier Room	$	2.2	0.8	5
Terascan: Replace with something else	$$	2.6	0.5	5
Future Lab with darkroom	$	3	0	3
Future lab w/o dark room	$	3	0	2

This is a version of the AICC “ranking” of proposed science upgrades and improvements provided in October 2007 sorted. Items ranked #1 are the AICC’s highest priority.

Multibeam Replacement

- The existing sonar is old, hard to maintain and provides mediocre data in deep water and worse in shallow water
- Consider the whole picture in planing a change

Overview of the multibeam upgrade. Choosing and installing the optimum sonar correctly the first time is much less expensive than engaging in remedial efforts and/or replacing one.

Sequence of Events

- [x] Engineering Change Request (ECR)
- [x] Installation Concept (approach, cost, time)
- [ ] Funding
- [ ] Detailed engineering (+shallow water)
- [ ] Install (CY 2009/10 drydock)
- [ ] Test (Spring/Summer 2010)
- [ ] Accept (Summer 2010)

This is the sequence of events required to get the new sonar installed. The target is for the drydock scheduled for the end of calendar year 2009 and early 2010. The ECR was done a couple of years ago and remains correct. MLC funded the concept design and the results are available. In order to stay on track, funding for the detailed engineering has to be released very soon. The current plan assumes that the EM122 shallow water performance will be acceptable. If it is not, we would propose to add an EM710 which could be installed in the old SB2112 transmitter location. This funding is in CG's budget request to NSF. Purchase of the actual sonar must happen at least 6 months before installation.

Sea trials and acceptance testing will be interspersed through the spring 2010 shakedown, transit and field season rather than take a block of time out of the early season operations. Acceptance and performance evaluation will need to include working in ice in addtion to the normal open ocean acceptance testing.

APPROXIMATE Cost

Description	Cost (USD) (1)
Purchase multibeam (2,3)	$2,700,000
Naval architect & engineering	$124,100
Shipyard	$381,000
Removal and disposal	$53000
Acceptance testing (10 to 20 days of ship time)	
Acceptance testing (staff)	$95,000
Training and Education curve	$30,000
Travel and subsistence	$20,000
Data system integration (labor)	$10,000
Data system integration (materials)	$10,000
Total Cost	$3,423,100

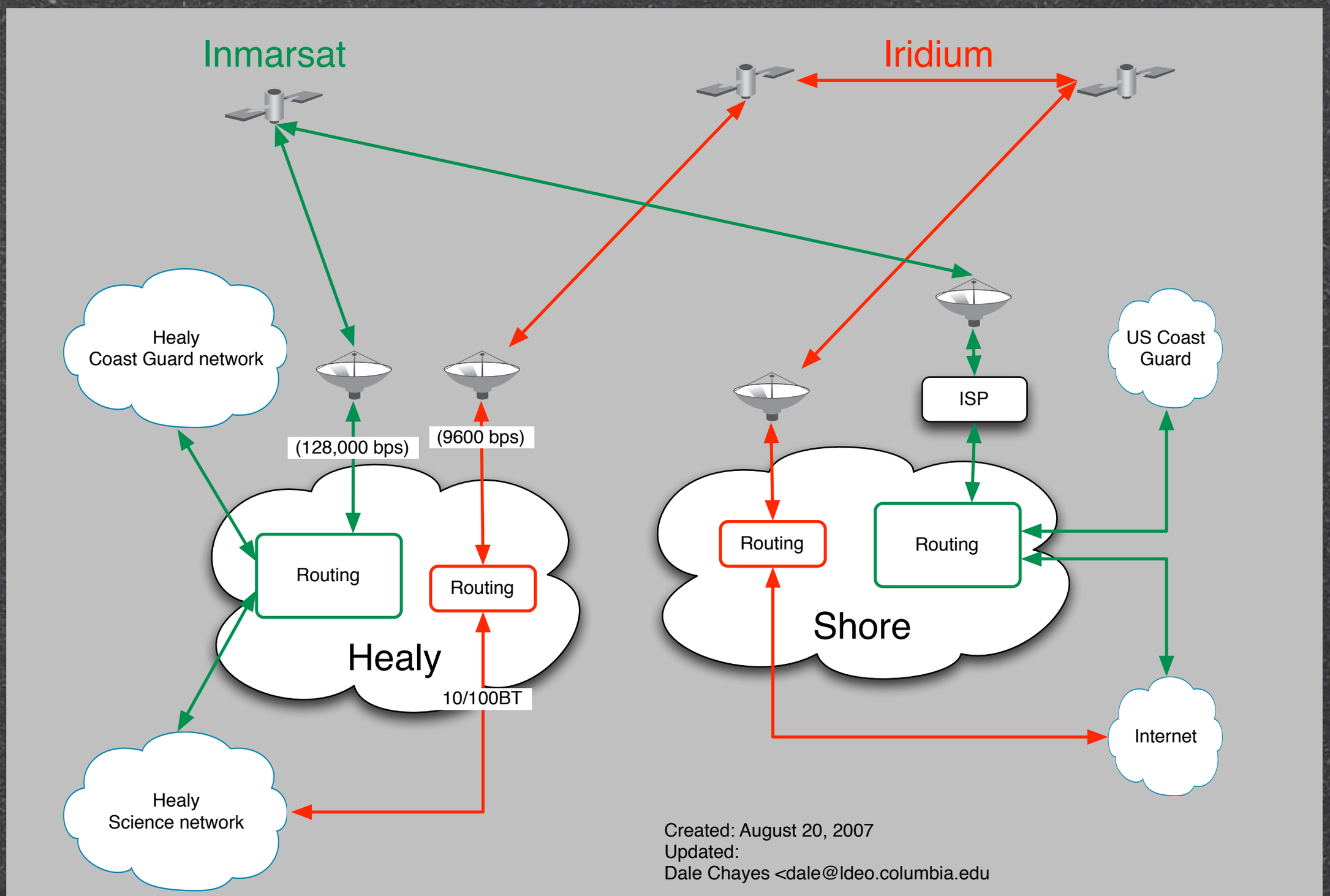
(1) No contingencies are included (add 20%)

(2) The value of the USD may have some impact

(3) Does not include a separate shallow water sonar

These budget figures are drawn from the existing concept evaluation reports from Alion and SAIC. Some funding is added to allow science technical support to do the integration, training, and evaluation. Approximately 20% should be added for contingencies. Further decline in the value of the US dollar will impact the cost of the sonar. These numbers do not include the cost of engineering, purchasing, installing and testing a shallow water sonar in the event that the shallow water performance of the EM710 is not adequate. It is reasonable to expect that we will know about the shallow water performance of the 710 early enough to accommodate changes.

Science Communications



This one-line diagram shows the two satellite digital data communication systems in use for science on the Healy.

The shared CG Inmarsat is used for real-time Internet connection (web, ftp, etc.) Approximately 1/2 half of the 128,000 bit per second (theoretical) channel is available for science through a secure routing arrangement. In order to provide reasonable performance, we block access to a number of protocols including instant messaging, Voice over IP, etc. and we allow web access only from the public science workstations.

The much slower (9,600 bit per second) is based on using “ganged” (paralleled) Iridium radio systems. This link is normally used for science email and for file transfer at high (about 75 degrees north) file transfer.

Our system allows accommodation of special science-driven access as necessary. We encourage science parties to plan ahead and work with us to accommodate their communication needs.

New TSG Location

- In Portside main deck passageway
- Ready to propose to NSF
- ECR documentation is ready

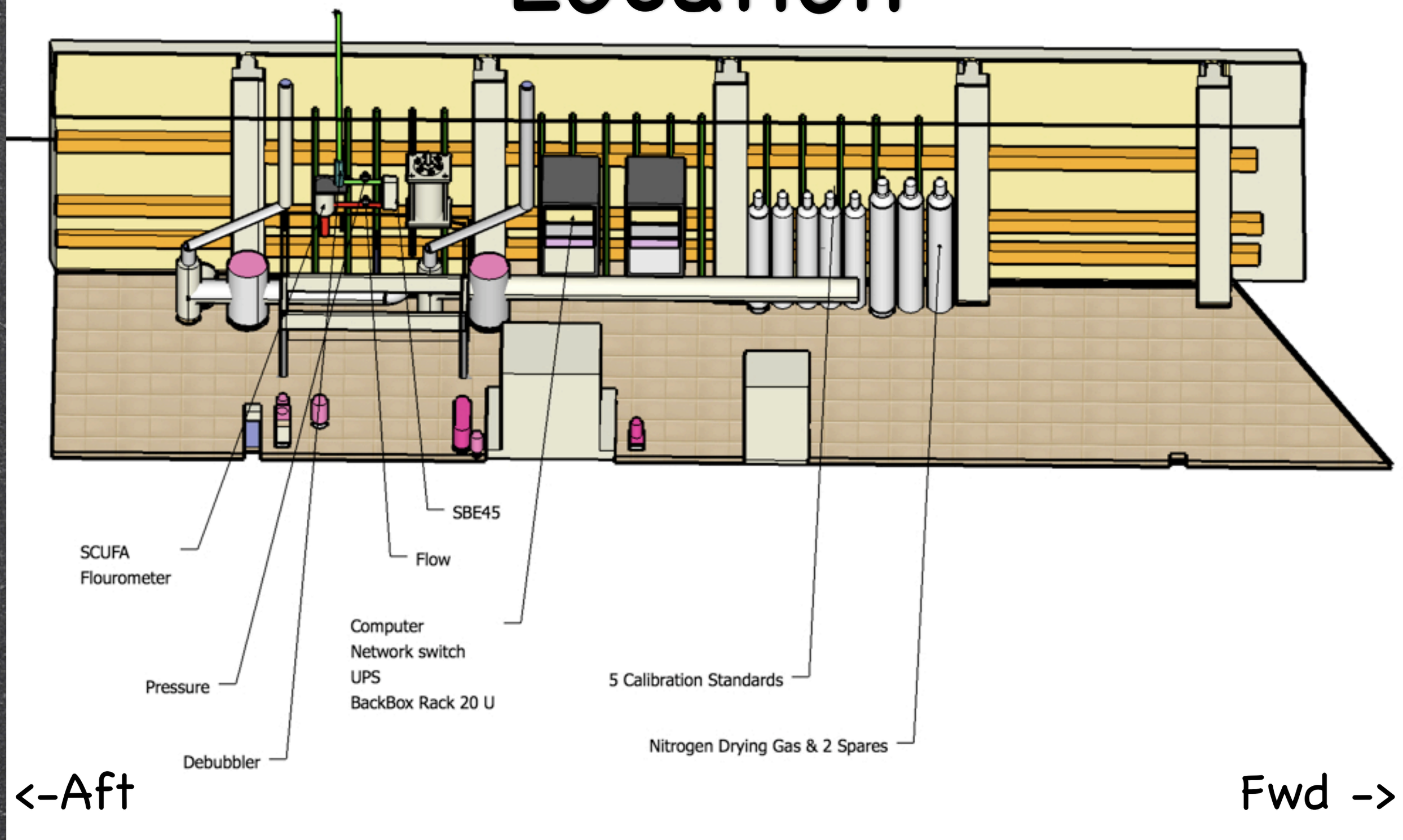
We are still trying to get the a new location implemented for the flow-through water system which includes the thermosalinograph, dissolved oxygen sensor, flourometers, etc.

pCO_2

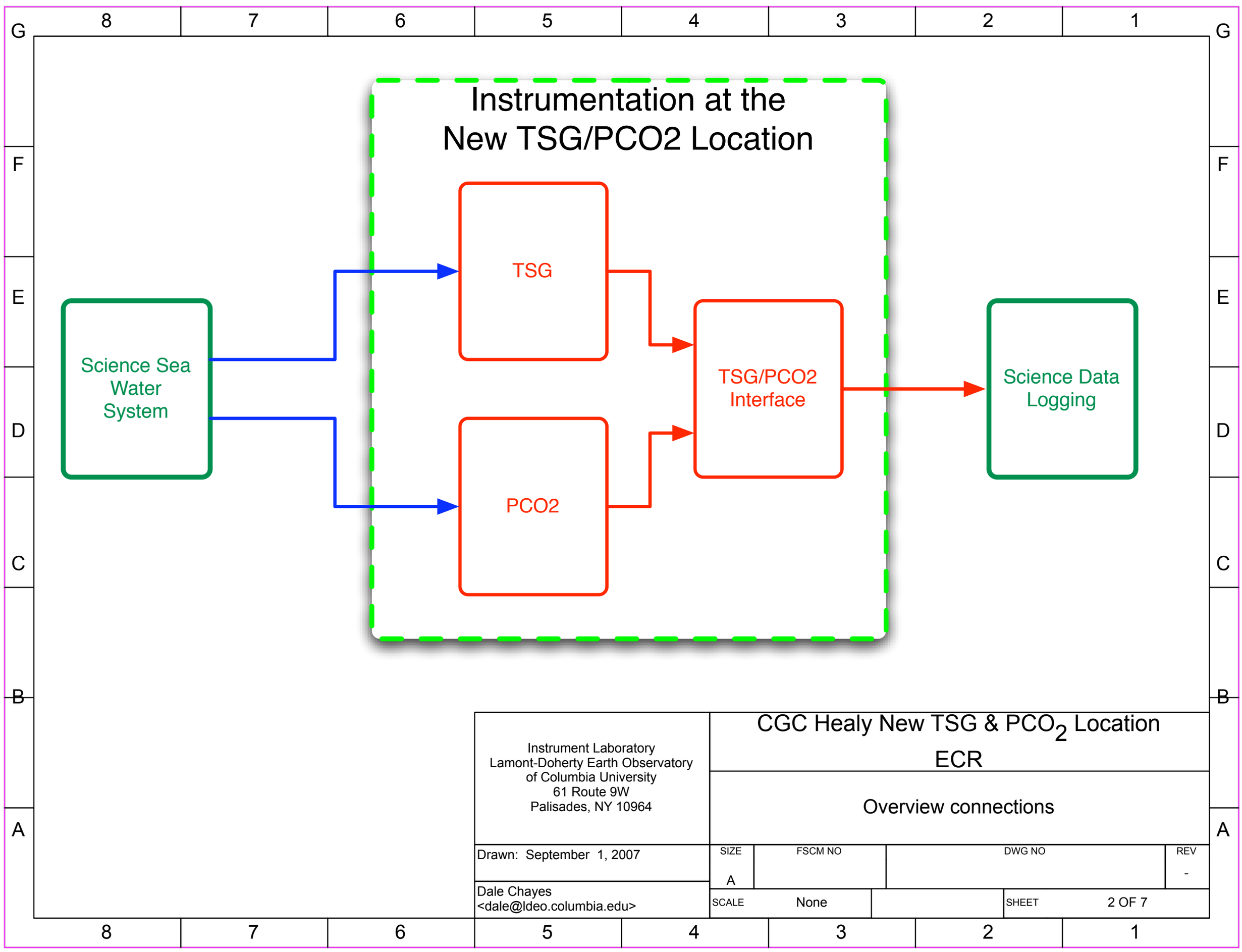
- Proposed by Taro Takahashi and Rick Wanakoff
- Permanent Installation
- Incorporated into the new TSG location (no impact on lab space)
- Onboard technical support needs review

There has been a recent proposal to add a system for measuring the partial pressure of CO2 in the surface waters.
The new TSG location plan includes this system and does not require any lab space.
We need to work with the proponents to more clearly define the support needs.

Thermosalinograph Location



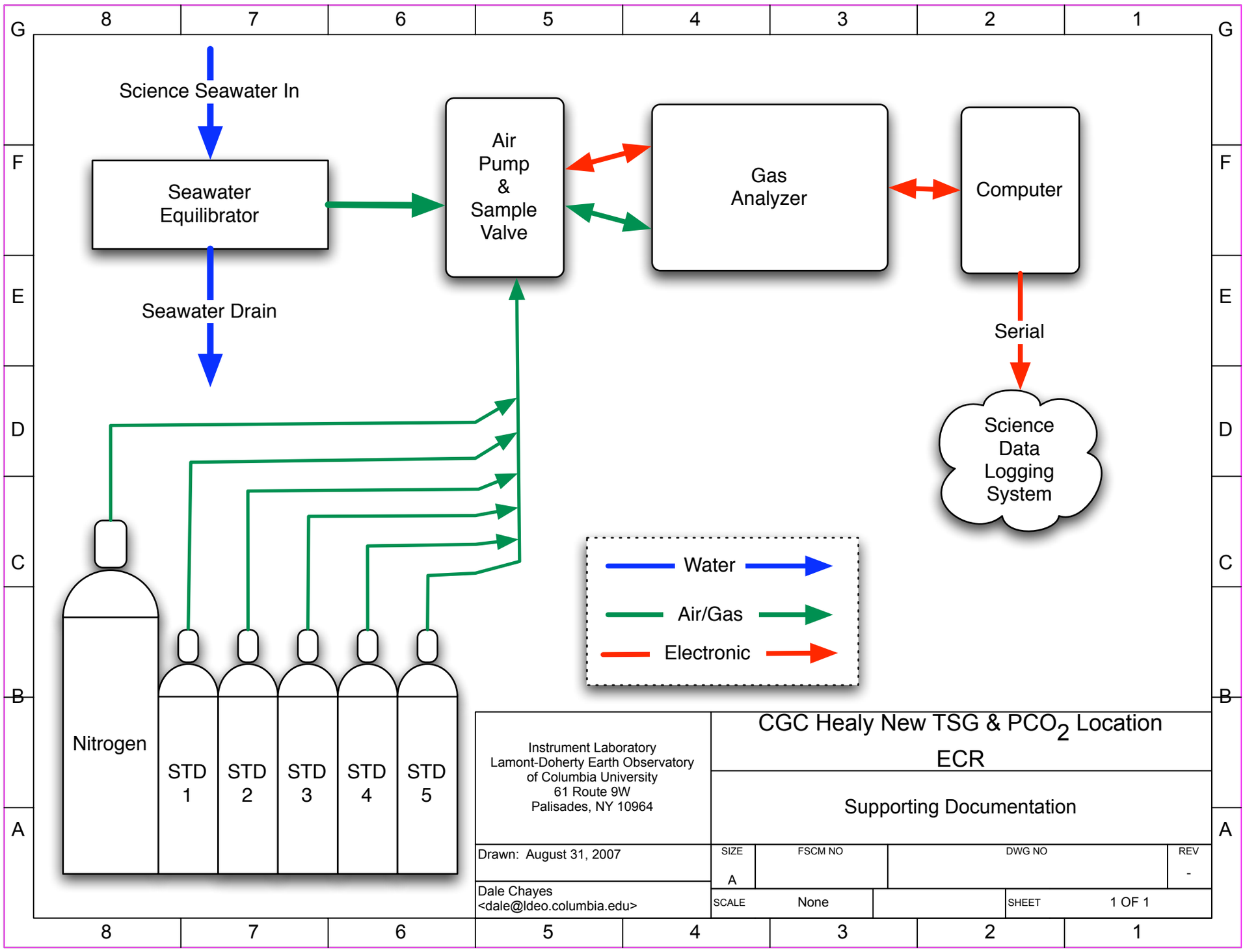
A scale drawing of the TSG and pCO2 system location in the port side main deck passageway

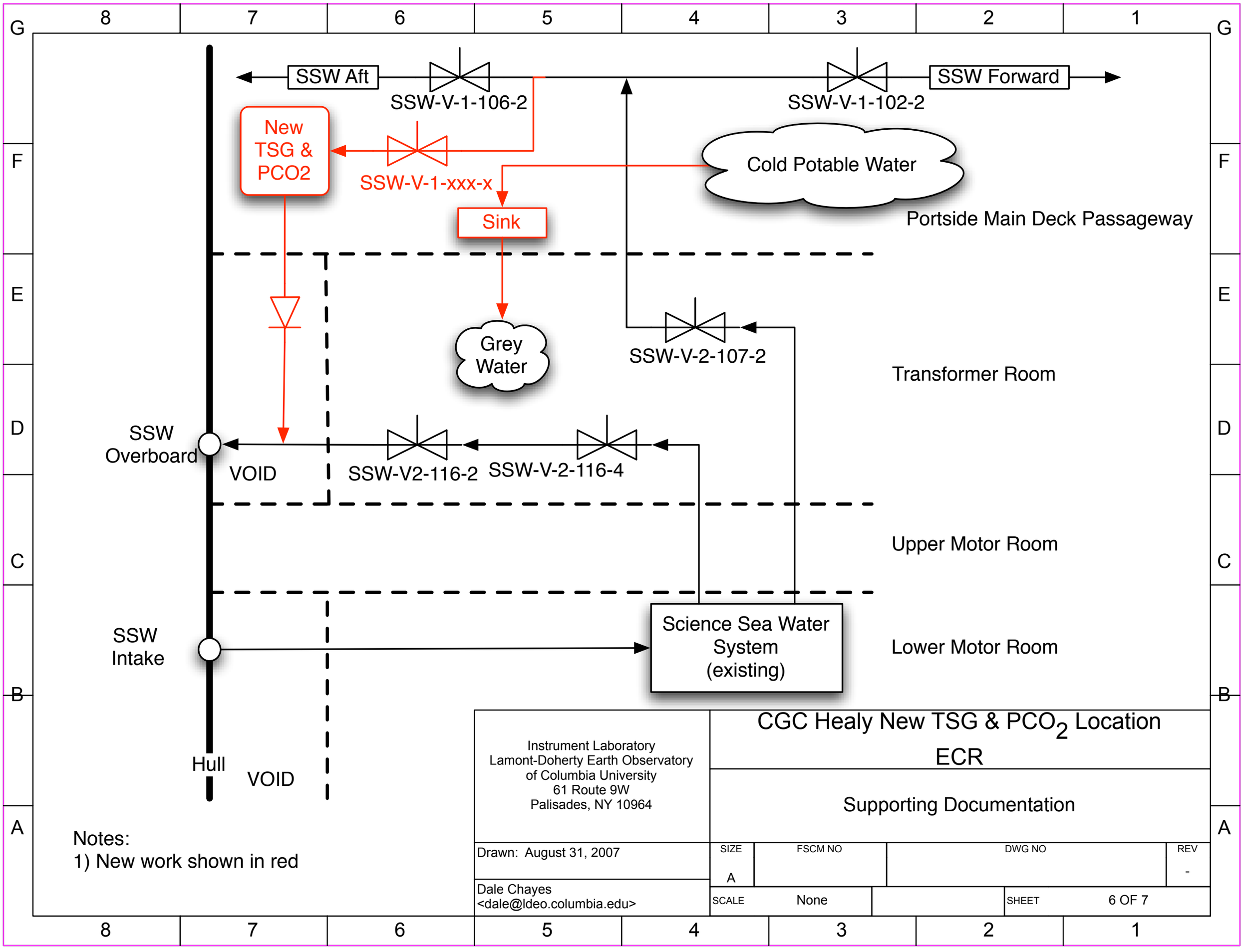


Instrument Laboratory Lamont-Doherty Earth Observatory of Columbia University 61 Route 9W Palisades, NY 10964	CGC Healy New TSG & PCO_2 Location ECR		
	Overview connections		
Drawn: September 1, 2007	SIZE: A	FSCM NO:	DWG NO: REV: -
Dale Chayes <dale@ldeo.columbia.edu>	SCALE: None		SHEET: 2 OF 7

Block diagram of the water and data flow for the TSG and pCO2 system

Flow diagram for the pCO2 system





Plumbing diagram for the new TSG/pCO2 system. New/changed plumbing is shown in red.

"Walk-in" Chambers

- They meet the SOR
- Inherently high maintenance
- Don't meet the desires of some science parties
- Need to define the actual requirements & then engineering

Summary of the status of the "walk in chambers". This includes the two reefer/freezers as well as the two climate control chambers. The humidity control in one of the two chambers is now currently working.

Lab Renovation

- Following ranking
- Pending indication that funding might be available
- Computer Lab is primarily a technical support issue

AICC has ranked the proposed lab renovations based on science needs. The Computer Lab renovation is an infrastructure/technical support need and is judged to be high priority. There is no point in submitting a proposal to fund this work until we have an indication that funding is possible.

Science Met System

- Ultrasonic (2 axis) anemometer
- Temperature & humidity
- Barometric pressure
- Precipitation (liquid only)
- Long and short wave radiation (+PAR)
- Sending data to SAMOS

Details of the new met system installed by UCSD/SIO/ODF this summer.

New Met Sensors

Evaluation during shakedown (2008)

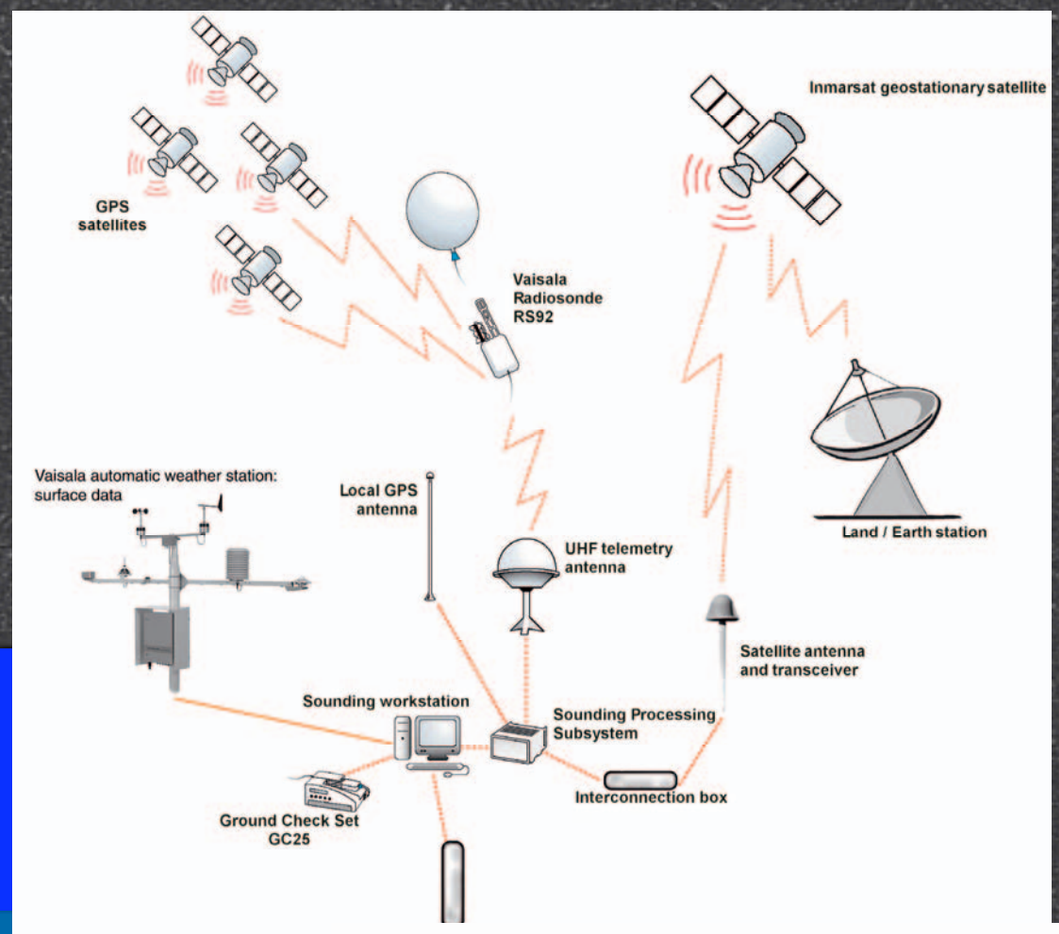
Pictures:
Left: new long and shortwave radiation sensors plus the PAR sensor that was installed in the spring of 2007.
Right: new sensors on the jack staff at the bow.

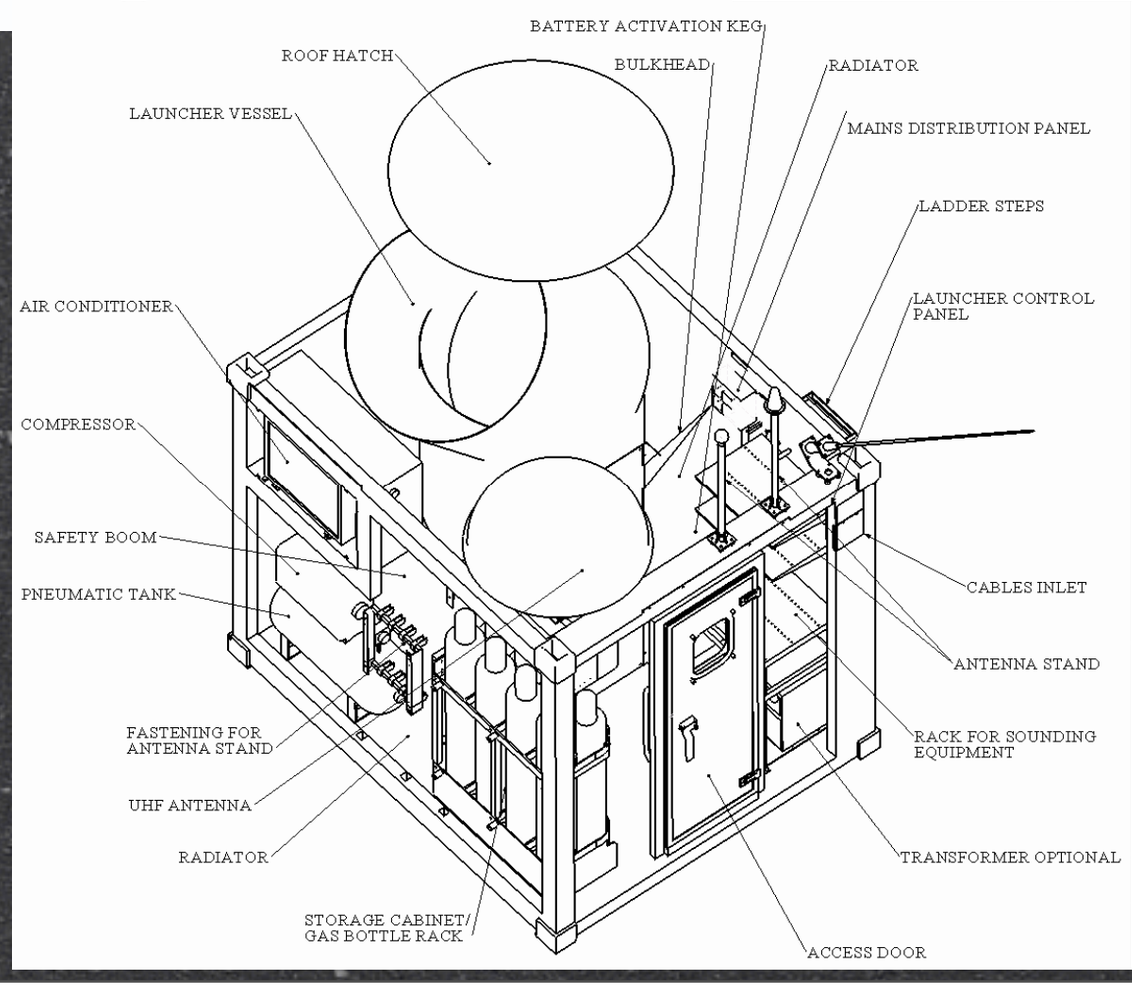
Proposed ADCP changes

- Engage the community technical experts (Firing et. al at UH/SOEST)
- Drafting proposal for support

In order to be less dependent on the existing windows based software from RDI for our ADCPs and to engage the communities technical expertise to help with the existing ADCPs we have been working with Eric Firing and Jules Hummon at the University of Hawaii to assemble a proposal for them to provide their software and support for ADCPs on the Healy.

Proposed Radiosonde





NOAA polar folks have asked us to consider adding a system to take radiosondes while the Healy is operating in the Arctic. We will continue to work with them on the details including the level of on-board support required. We assume that manual launching will be required and there will be a significant volume of expendables.
Based on input from Peter Minnett, we would plan for 6 balloon fills per full size Helium bottle.
Minimum of 1 sonde per day. Better 2 or 4 per day.

Equipment Purchases

- What does science & technical support need?
- What belongs in science proposals?
- What should the facility provide?

We need to clarify the guidance on who is supposed to propose (and fund) equipment. AICC could provide some input to NSF and CG on this.

Equipment for 2008+

- [x] New met system
- [x] Replace the network disk store (ESU)
- [x] Racks for Windows servers and disk store
- [ ] Small additional disk space for backups
- [ ] Aircraft Non-Directional Beacon (NDB)
- [ ] Gravity Meter
- [ ] Science Inmarsat?

UCSD/SIO/ODF (Scott Hiller) has completed the installation of new met sensors on the bow.
ESU has replaced the network disk system (Snap Servers) with Apple Xraids. Testing remains to be done prior to shakedown.
ESU has purchased (2?) new racks for the Windows servers and Xraid. It is not clear if they will be installed prior to this season
LDEO is planning to add some disk space for backing up our (LDS and Mapserver) computers.
LDEO is working with CG to add a “homing” beacon on Healy so that commercial aircraft (like our contracted helos) can find the Healy in the event of marginal weather and/or GPS problems.
NSF has funded a BGM-3 gravity meter for Healy through a proposal by Dan Fornari and Bernard Coakley to the national gravity meter pool managed through WHOI.
We need to add a Science Inmarsat to provide some fall-back in the event of a CG Inmarsat failure and because sharing the CG Inmarsat will eventually not be an option for science.

Longer term items

- Fiberoptic "0.681" deep tow cable (when there is a funded need)
- Science V-sat: as soon as we can afford it or we are forced of the shared Inmarsat
- Subbottom profiler transducer replacement (2008)

Need for a 0.68" fiber-optic two cable has been and will continue to be episodic Healy. Each event so far has been accommodated by temporarily installing a large, complex and heavy traction winch on the fantail. These installations are complicated and expensive and consume much of the working deck. When we anticipate the next need, we propose to purchase a cable, wind off the existing .68 (coper only) tow cable and wind the fiber on for the season. We would remove the fiber at the end of the season to avoid storing it for long periods of time under tension. No such need exists for the 2008 field season.

Science and science technical support on Healy needs 24x7 Internet connectivity. This is provided on all of the large UNOLS vessels using a very small aperture satellite terminal (VSAT.) At present, this capability is provided on Healy by sharing the CG's leased 128kbps Inmarsat connection. In the future this sharing arrangement will be precluded by CG needs for bandwidth and/or security restrictions. We are continuing to plan for the installation of a large (3m) VSAT antenna and routing hardware on Healy. Current cost estimates suggest that purchasing the equipment and leasing "air" time is the most cost effective solution.

The subbotom profiler transducers on Healy have been in service since 2000 and should be overhauled. The traditional method is to purchase a spare set and install them. The used units can then be overhaulled and re-installed in the future.

CY 2009/10 Drydock

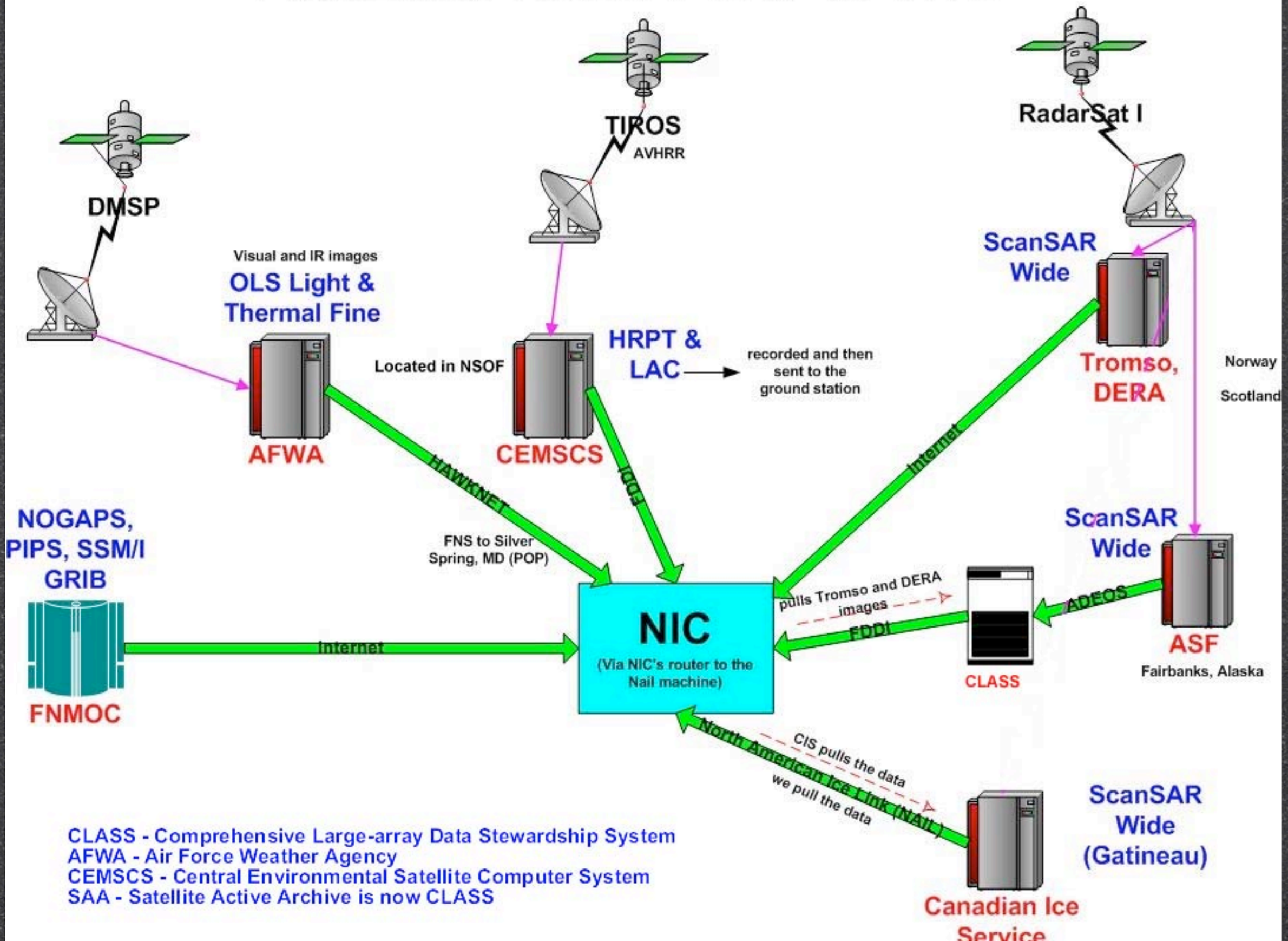
- Multibeam replacement
- VSAT (or 2008?)
- Winch changes?
- Helo hanger access?

The multibeam replacement is (so far) on track for completion during the next scheduled drydock
The VSAT antenna installation should be done before then, but could be done then.
It is probably too late to plan for substantial winch changes in 2010 but we should start thinking about that.
There is no way to access the interior of the ship from the hanger. This needs to be addressed.

End of slides presented

There are more slides in this deck
but there was not enough time

External Data Flow to NIC



CLASS - Comprehensive Large-array Data Stewardship System
AFWA - Air Force Weather Agency
CEMSCS - Central Environmental Satellite Computer System
SAA - Satellite Active Archive is now CLASS

This block diagram shows the data paths for RADARSAT data to the US Nationa/Naval ice center which provides them to Healy via data transfer. It was an action item from last year (or the year before.)

Personnel Support

- LDEO: two people per leg
- ODF: for some legs
- OSU: Limited "coring" this year
- ESU (one Windows support person) per leg
- Staffing after we understand the detailed cruise plans

Individual staffing decisions are starting now that we have a schedule and some details about most if not all of the cruises. It is too early to name names.

#	Group	System	Shared Use?	Operate	Maintain	Upgrade
26	comm	Communications, wired e.g. phones	**Yes**	Science Party	Ship	Ship
27	comm	CG leased Inmarsat	**Yes**	Ship	CG Shore Support	CG Shore Support
49	comm	Ship to ship digital comms (SWAP)	No	Science Support	Science Support	Science Support
31	comp	General Purpose Data Processing Computers (Linux servers)	No	Science Party	Science Support	Science Support
32	comp	Multibeam data routing	No	Science Support	Science Support	Science Support
36	comp	LDS Logging System	No	Science Support	Science Support	Science Support
37	comp	Time Servers	No	CG Shore Support	CG Shore Support	CG Shore Support
41	comp	Mapserver	**Yes**	Science Support	Science Support	Science Support
50	comp	Data distribution and archive	No	Science Support	Science Support	Science Support
51	comp	Data quality evaluation	No	Science Support	Science Support	Science Support
55	comp	SCS Logging System	No	CG Shore Support	CG Shore Support	CG Shore Support
9	deck	Science Hoist	No	Ship	CG Shore Support	CG Shore Support
10	deck	A-Frames	No	Ship	CG Shore Support	CG Shore Support
11	deck	Cranes	**Yes**	Ship	CG Shore Support	CG Shore Support
12	deck	Capstans	**Yes**	Ship	CG Shore Support	CG Shore Support
23	deck	Winches/Wires	No	Ship	CG Shore Support	CG Shore Support
24	deck	Wire data Displays	No	Ship	CG Shore Support	Ship
34	deck	Coring Equipment	No	Science Support	Science Support	Science Support
3	info	CCTV	**Yes**	Ship	Ship	Ship
33	info	(Science) Navigation Computer & software	No	Science Support	Science Support	Science Support
43	info	WebCams	No	Science Support	Science Support	Science Support
45	info	Science Inmarsat	No	Science Support	Science Support	Science Support
46	info	Science VSAT	No	Science Support	Science Support	Science Support
52	info	Windows Servers	No	CG Shore Support	CG Shore Support	CG Shore Support
53	info	General Purpose Science Workstations	No	Science Party	CG Shore Support	CG Shore Support
54	info	Science Networking	No	CG Shore Support	CG Shore Support	CG Shore Support
56	info	Communications, wireless e.g. computer network	No	Science Party	CG Shore Support	CG Shore Support
58	info	Science Email	No	Science Party	CG Shore Support	CG Shore Support
13	lab	Uncontaminated Seawater System	No	Ship	Ship	Ship
15	lab	Science Reefers, Freezers, Climate Control Chambers	No	Science Party	Ship	Ship

During the previous AICC meeting we agreed that we would try to define which of the various groups had the “lead” or “responsibility” for systems that are (or directly impact) science. This (and the next) slide provide a very simplified view of the current state of that process.

#	Group	System	Shared Use?	Operate	Maintain	Upgrade
16	lab	Fume Hoods	No	Science Party	Ship	Ship
17	lab	Eye wash stations	**Yes**	Ship	Ship	Ship
42	lab	Watch Stander Work Station	No	Science Support	Science Support	Science Support
1	nav	Centurion GPS	**Yes**	Ship	Ship	CG Shore Support
2	nav	Ashtech 3DGPS (ADU5)	**Yes**	Ship	Ship	CG Shore Support
6	nav	Forward P-Code GPS (Rockwell Collins)	**Yes**	Ship	Ship	CG Shore Support
7	nav	Gyro Compasses	**Yes**	Ship	Ship	Ship
8	nav	Integrated Bridge System	**Yes**	Ship	Ship	Ship
19	nav	Speed Log (SRD500)	**Yes**	Ship	Ship	Ship
35	nav	POS/MV	No	Science Support	Science Support	Science Support
4	ocean	DI/RO Pure Water	No	Science Party	Science Support	Science Support
5	ocean	Fluorometer	No	Ship	Science Support	Science Support
18	ocean	XBT System	No	Ship	Ship	Science Support
20	ocean	Terascan	**Yes**	Ship	CG Shore Support	CG Shore Support
21	ocean	TSG	No	Ship	Science Support	Science Support
22	ocean	Met Sensors (Navigation)	**Yes**	Ship	Ship	Ship
25	ocean	Bridge echo sounder (BATHY 1500)	**Yes**	Ship	CG Shore Support	CG Shore Support
28	ocean	ADCP (150khz)	No	Science Support	CG Shore Support	Science Support
29	ocean	ADCP (75khz)	No	Science Support	CG Shore Support	Science Support
30	ocean	CTD	No	Science Support	Science Support	Science Support
38	ocean	Multibeam Sonar	No	Science Support	Science Support	Science Support
39	ocean	Sub-Bottom Profiler	No	Science Support	Science Support	Science Support
40	ocean	Velocimeter for ADCP's	No	Science Support	Science Support	Science Support
44	ocean	Gravity meter	No	Science Support	Science Support	Science Support
47	ocean	Through hull temperature	No	Science Support	Science Support	Science Support
48	ocean	Science met & radiation sensors	No	Science Support	Science Support	Science Support
14	sci	Science Berthing	**Yes**	Science Party	Ship	Ship
57	sci	Science Spaces (Labs, Lounge, Winch Room..etc.)	Yes	Science Party	Ship	Science Support
59	sci	Planning and Integration for Visiting Science Equipment	**Yes**	Science Support	Science Support	Science Support
		Ship = The officers and crew of USCGC HEALY				
		Science Support = NSF Funded Support from Oganizations such as ODF, LDEO, OSU				
		CG Shore Support = Coast Guard Units other than USCGC HEALY e.g. NESU, ESU, MLC				
		Science Party = Emarked Science Party				