# THE MSRC VORTEX DEBUBBLER 1987 - 2018

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#### Alexander Sneddon

Ocean Instrument Laboratory • School of Marine and Atmospheric Sciences Stony Brook University • Stony Brook NY 11794 USA Alexander.Sneddon@stonybrook.edu





Stony Brook University School of Marine and Atmospheric Sciences



## **EQUATION 1:**







### **BUBBLE SOURCES**

Ingestion/downsweep.
Cavitation.
Degassing.





### HEAD TANK



Takes up space. Heavy. Slosh problem. Low pass filtering problem.





## CYCLONIC DUST SEPARATOR





Collects sawdust in commercial woodworking.





### **REVISION A - 1987**



Aboard B/O *Garcia del Cid* in Western Mediterranean.

Classic R&D prototype: string, hose clamps, tape, core tube, & re-purposed office supplies.

Located over wet lab sink because it leaked like a sieve:

BUT IT WORKED. (...just look at that vortex!)





### **REVISION B - 1988**



#### Huntington Harbor / Oyster Bay Long Island.



String and tape are gone. Leaks less, rusts more, essentially impossible to clean.



## **REVISION G SCHEMATIC**



(Vortex chamber cut away to show baffle plate) 1: input, 2: input valve, 3: injector plate, 4: vortex chamber, 5: output baffle plate, 6: output valve, 7: output, 8: waste valve, 9: waste exhaust, 10: top plate, 11:mounting plate, 12: upper and lower gaskets, 13: clamping bolts. (image by HandCAD 1.0)





## **TWO STANDARD SIZES**



3 inch diameter, internal volume ca. 1 liter. Design flow rate 18 - 24 liters per minute (4.75 - 6.35 gpm). Recommended for instruments such as the Seabird SBE21 thermosalinograph.

2 inch diameter, internal volume ca. 0.5 liter. Design flow rate 9 to 12 liters per minute (2.4 - 3.2 gpm). Recommended for instruments such as the Seabird SBE45 thermosalinograph.

Other sizes (1.5 - 6 inch diameter) by custom order.

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### ABOUT 229 DEBUBBLERS BUILT TO DATE most still in service

Antarctic Support Associates Bermuda Biological Station **Bigelow Laboratory** Chand, LLC. **Chem-Free Purification** Duke University ExplorOcean Technology (UK) Lamont-Doherty Earth Observatory LUMCON **MBARI** Moss Landing Marine Labs Naval Oceanographic Office Naval Research Laboratory NERC Southampton (UK) NIWA (New Zealand) NOAA AOML **Oregon State University** 

**Raytheon Polar Services** NATO SACLANT (Italy) Scripps Institute of Oceanography Sea Education Association **Sea-Bird Electronics** SKB nv (Belgium) Skidaway Institute of Oceanography University of Delaware University of Miami University of Rhode Island University of South Florida University of Texas University of Washington University of Puerto Rico **US Coast Guard** WET Labs WHOI



### **INSTALLATION ON R/V Sally Ride**



### LATEST REVISION H Bottom plate can be removed by hand for easier cleaning. Retrofit available for many earlier units.











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