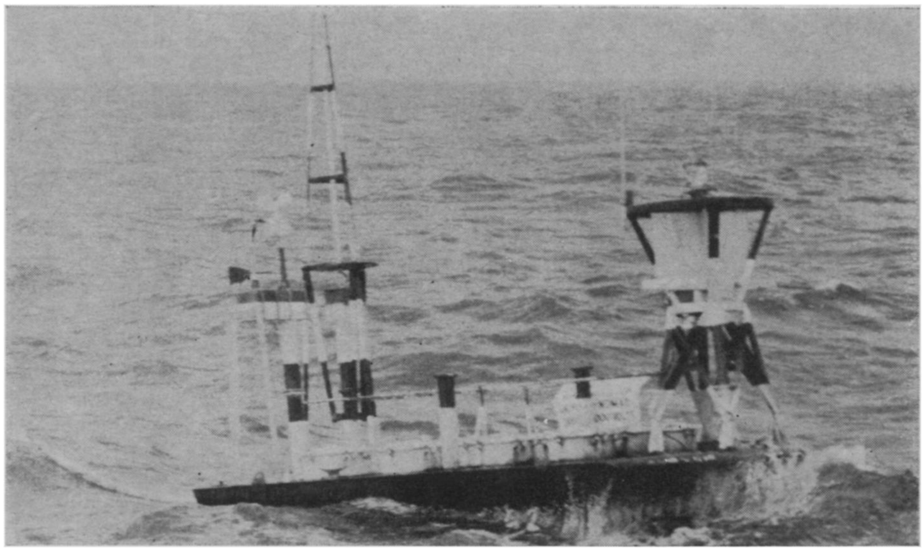


Navy

Nuclear nomad in the Gulf of Mexico: putting the SNAP in future buoys.

Sea Eyes: an Ocean of Buoys

by Jonathan Eberhart

In the middle of this coming October, a report will quietly be presented to the government by the Traveler's Research Center of Hartford, Conn. Though the study is a small one, costing less than $290,000, there will be more big federal agencies anxiously awaiting its results than any comparable study in recent years.

The subject is buoys—a vast network of them spread throughout the seas. The Army, the Navy, the Weather Bureau, the Coast and Geodetic Survey, the Atomic Energy Commission and at least half a dozen other government departments all have something to gain from the coming Federal Ocean Buoy System.

Buoys are a problem.

Some work fine—they're cheap enough and reliable enough—for the relatively small-scale jobs that exist for buoys today. But for at least five years there has been a need for a globe-spanning grid of buoys, spaced perhaps as closely as every 400 miles, to provide continuous monitoring of the world's oceans. Such a task will require an entirely different breed of buoy than any now available.

Though they cannot be as flexible as a manned lightship, or as well-instrumented as a fixed tower, buoys are nevertheless the only practical way to provide world- or ocean-wide data on water temperature, salinity, pressure, currents, wave heights, oxygen content, chemical concentrations, air conditions, the "air-sea interface" and the other facts about air and sea increasingly needed by students of the interplay among earth, sea and air.

Presently, such information ranges from haphazard to unavailable. A lone research ship is sometimes sent out to take a series of readings, but the passage of time as it makes its measurements means that there is still no map available of an entire area for any single time, and no real-time ocean profile.

A truly worldwide grid would run into the hundreds or even thousands of buoys which by very number overreaches the state of the art.

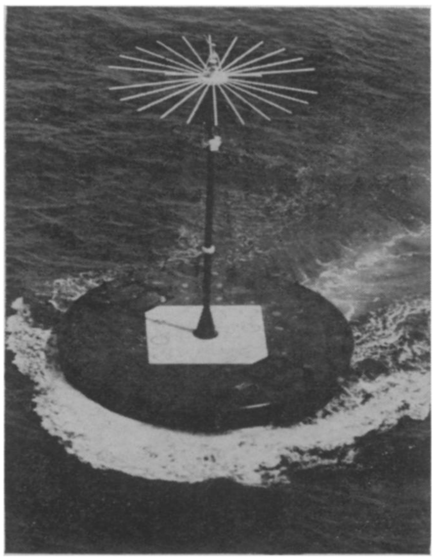
In such numbers buoys could not possibly be checked every few months or even annually as they now are. Thus three factors, reliability, power source and mooring, must all be developed well beyond their present state.

Making a reliable buoy is largely a matter of providing automatic longevity and protecting it against the elements and the constant buffeting of the waves. For life-spans of 5 to 10 years this will require new kinds of all-weather paint, new metal alloys and perhaps new kinds of instrument mountings.

Without dependable power, however, the best buoy in the world is useless. Presently, the overwhelming favorite is batteries, often recharged periodically by propane-driven generators. But generators need fuel, and that takes up both space and weight. Solar cells, which depend upon at least reasonably regular sunshine, would be a poor bet in some parts of the world. The most likely candidate is nuclear power. Atomic generators fueled with plutonium, thulium or other isotopes could provide years of trouble-free operation. One Navy test buoy has been operating for 18 months in the Gulf of Mexico on a SNAP 7D nuclear powerplant.

One of the biggest problems is how to tie all these buoys down.

A solution being investigated by the Navy is the use of buoys that sit on the ocean bottom in tanks of heavier-than-seawater preservative liquid and rise to the surface only for brief, preset intervals to collect data. Then they reel themselves in again, leaving their mooring lines protected and secure. This technique might be needed for another reason, too: if large numbers of buoys do become a reality (the Weather Bureau alone wants 400), they could be a serious shipping hazard. Keeping them out of the way except when need might even become a requirement of maritime law.



General Dynamics

The Monster stands steady in the sea.

In case heavy mooring lines do prove to be the most durable choice, glass-ball floats are being tried to make the cables effectively weightless, and keep them from dragging the whole buoy down with it.

Buoys aren't what they used to be. Instead of little bobbing things that look like refugees from an erector set, they now come shaped like telephone poles, ice cream cones, flying saucers, catamaran (twin-hulled) boats, crosses and steering wheels.

But if the buoys themselves are a hodge-podge, the things demanded of them are even more so. The Maritime Administration, for example, is concerned about new kinds of ships, such as hydrofoils and hovercraft, less at home in rough water than conventional vessels. Present ways of predicting rough seas are "inadequate," it says, and a well-instrumented buoy net might be critical.

The Navy wants buoys to keep track of numerous water conditions which affect the hearing of sonar and other submarine-spotting devices. One future plan, now being tested, calls for buoys so sophisticated that they can tell U.S. and Russian submarines apart. A buoy that hears a submarine would automatically consult a computerized library containing the characteristic sound patterns of all known undersea vessels and then signal the nearest shore station by teletype.

The Army Corps of Engineers is just fed up. In trying to keep track of shore erosion whatever ocean monitoring it has been able to do, has been from land-based installations that are used primarily for other things, and from second-hand data collected by other agencies. Funds for off-shore buoys are inadequate, as, for that matter, are the only buoy systems presently available for the job.

Several agencies could use buoys but can't afford to build them. The Bureau of Commercial Fisheries says that year-to-year fish harvests often drop as much as $50 million because of lack of knowledge of migration patterns that could be obtained from buoy-borne hydrophones. Other agencies' plans include studies of ice flows around Newfoundland, hurricanes around Florida and water pollution in the Great Lakes.

If each agency, bureau, department, commission, administration, office and command got its own buoy system, the federal government would soon find itself swamped by duplication. To prevent this, Traveler's was assigned the task of weeding out the duplications, organizing what is left, and coming up with the master plan for "an inter-agency system of buoys for exploring, explaining and exploiting the sea."

With all this government interest, new buoys designs have been popping up like mushrooms in a damp cellar. One is the Monster, a 100-ton pieplate 40 feet across and instrumented to measure everything from air pressure to solar radiation reflecting off the ocean. One test model, which has been moored off the Florida coast for two years, proved its stability when it sat calmly through the 50-foot waves and 110-mile-an-hour winds of Hurricane Betsy in 1965, tied down by nothing but a two-inch-thick nylon rope, and never missed a beat in transmitting data.

A British company has proposed what would be the largest buoy afloat: a 450-foot spar-shaped structure which would float upright in the water with most of its length below the surface. The proposal may well be the most expensive too, since the company suggests having one every 400 miles.