

PACER 950XL

DACOR PACER 950XL

TEXT AND PHOTOGRAPHY BY
GEORGE COZENS



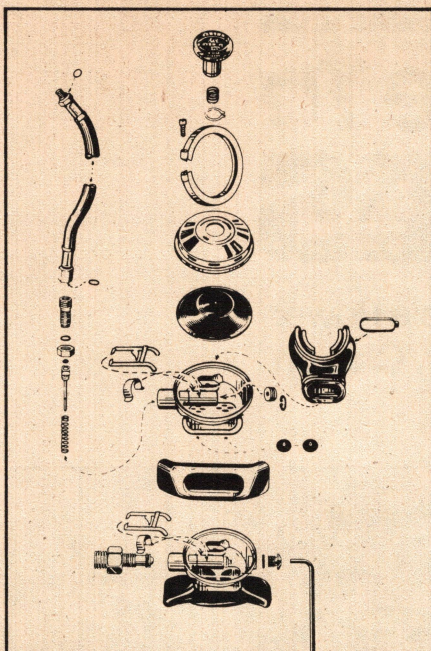
In 1954, the Dacor Corporation of Northfield, Illinois started experimenting with a second stage design that could harness the venturi effect, in an attempt to reduce the breathing resistance of its regulator. Although the venturi effect was well known at the time, it was just beginning to be applied to regulator design. Simply put, if air from the second stage supply valve is directed into the mouthpiece, the flow (when the valve is opened) will create a suction (the venturi effect) which reduces the air pressure within the second stage. This reduced pressure allows the diaphragm to be pushed inward (by the higher external, or ambient pressure) which, in turn, presses on the demand lever opening the supply valve wider. Because the venturi does the work of keeping the air flowing, the diver

has to work less to get the same amount of air. When inhalation is stopped, air pressure should build up within the second stage, push outward on the diaphragm and close the supply valve. If the venturi effect is not controlled, a runaway situation can occur, in which the process accelerates itself. The result can be violent freeflowing, and/or excessive air flow to the diver.

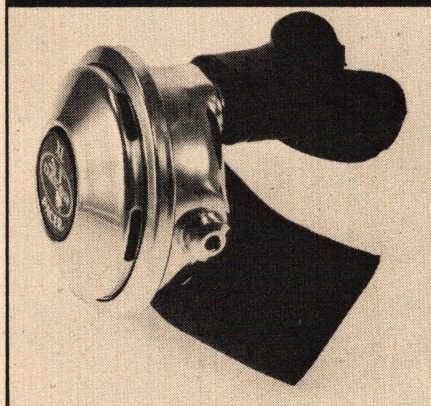
By 1956, Dacor had invented the "Dial-A-Breath" regulator. This two hose system used an adjustable vane to "split the venturi," in order to get an easier breathing regulator, while still trying to control the venturi effect. In Dacor's own words, "it fell short of our expectations." Small wonder. Controlling the venturi effect has been a long and difficult challenge. A number of manufacturers have been

working on the problem for years. Dacor, in fact, spent over 24 years (and a large sum of money) in developing an easy breathing regulator, which uses the venturi effect to advantage. The end result of this extensive development campaign is the Pacer series of regulators.

Pacer is an acronym for Positive Air Controlled Equalizing Regulator. As you might guess, with all this development, the Pacer second stages exhibit some interesting features. Probably foremost in controlling the venturi effect is Dacor's "Venturamatic Flow Vane," a long name for a remarkably simple device. It is a specially shaped, stainless steel vane (actually an integral part of the demand lever), which moves into the flow of air from the supply valve, to interrupt and deflect some of the air back into the second



The 950XL second stage uses a controlled venturi effect and improved valving to reduce breathing effort.



stage, thus limiting the venturi effect at high flow rates. A Venturamatic Booster Clip functions as a short metal shroud, partially surrounding the supply valve, to aid in dispersing part of the air flow and creating/controlling the venturi. The combination of the Vane, and the Clip produce what Dacor calls an air balanced second stage. The term balanced often refers to a design feature of first and second stages, which means that their performance (breathing characteristics) is not affected by changes in the pressure supplied to them. If a second stage is balanced, in this sense, some means of pressure relief needs to be provided, so that if the intermediate pressure gets excessively high it can be vented off before the hose or coupling bursts. Such a device is not necessary on the Pacer sec-

ond stages because the supply valve is a downstream design: It will open in case of excessively high supply pressures.

Another nice feature in the second stage is the "anti-freeflow device." This consists primarily of a special channel along the side of the mouthpiece opening, which allows water to enter the interior at the same time air inside is escaping, so when the unit is removed from the mouth, water quickly (within about three seconds or less) displaces the air, stopping any freeflow.

The materials used in the unit's construction are, of course, corrosion resistant: triple plated brass (copper, nickel, and chrome); stainless steel; neoprene; and silicone.

Recently, Dacor made additional improvements in the Pacer line: improvements which are incorporated in the Pacer regulators with the XL designation. In these, the dual exhaust ports were enlarged by about 40 percent to reduce exhalation resistance. The exhaust valves were enlarged to match, and are made of flexible silicone in a new, convoluted shape, designed for easier recovery, improved strength and longer life. The exhaust tee (manifold) was enlarged for greater capacity and given an upswept angle, to further decrease exhalation effort. And, the mouthpiece angle was also changed, to allow the exhaust tee to rest more comfortably on the diver's chin. These changes, Dacor indicates, have reduced exhalation effort, resulting in a better matching of the inhalation and exhalation cycles, so that breathing underwater more closely simulates breathing at the surface.

One additional second stage feature can be very convenient, if needed: the unit can be finely tuned by any service center or Dacor dealer, without disassembly.

The first stage of the 950XL is a balanced (against changes in tank pressure) diaphragm design, constructed of heavy, forged naval brass, with a triple chrome plating. It provides two high pressure ports, four low pressure ports on a swivel block and a swivel yoke rated at 3000 psi. An optional DIN connection is available for use on European equipment. Also available are environmental conversion kits for protecting the first and second stages from harsh dive conditions. Except for the first stage environmental kit (and, of course, the diaphragm) these same features are offered by the Pacer 650XL, which uses the same second stage as the 950XL, but has a balanced, flow-through piston first stage.

As for maintenance, Dacor suggests rinsing the unit with fresh water after each

use, drying completely and storing in a dry location away from excessive heat. Replacing the dust cap, when the regulator is not in use, will help keep moisture and other contaminants out of the critical areas of the first stage. At least annually, the regulator should be inspected and/or serviced by an authorized (Dacor) service center. (In fact, an annual check of this kind is a requirement to keep the ten year limited warranty in force.) Obviously, these are good recommendations to follow for the care of any regulator.

In my own evaluation of the Dacor Pacer 950XL, I found the regulator breathes quite easily. Only a little resistance was noticed during both light and gross inhalations. Likewise, relatively little resistance was felt while exhaling, from small to very large exhalations. And, talk about being exhausted, practically all of the bubbles ascended at the sides, with only a few rising in the center of view—tilting my head down just a few degrees below the horizontal position directed all of the bubbles away from the field of view. Breathing characteristics while in different orientations underwater changed no more than what I would expect from any single hose regulator. When on my head (upside down), and flat on my back (looking straight up), I was happy to experience no water entry into the second stage. When I took the second stage out of my mouth to check freeflowing I was a little surprised. Regardless of which way I pointed the mouthpiece and no matter if the second stage was full of air, or if I depressed the purge, the unit would not freeflow for more than a few seconds. Over all, the Pacer 950XL performed well, and exhibited no peculiarities—well, maybe a little one: when I rolled my head to the side (right or left) so the exhaust tee was vertical (one end pointing up), a slight freeflow was noticed; not much, just a slow bubbling.

A much more extensive test of the regulator's performance was conducted by the treasure hunting/salvage crew working on the 1641 wreck of the Spanish galleon, *Concepcion*, off the Dominican Republic. At depths of about 60 feet, under very poor conditions (described as an "underwater sandstorm," during the dredging operations), the Pacer regulators performed trouble-free for approximately five hours of bottom time each day and a total time of 3000 hours for the whole expedition.

That speaks well for the Pacer regulators. They were successful before the improvements, and should be even more so now. It appears as though Dacor has improved on success. The Dacor Pacer 950XL sells for \$230 at dive stores. >