

US DIVERS MISTRAL FAMILY

In the early 1950s, Emile Gagnan and his assistant worked to eliminate the two step pressure reduction system that had been in use since commercial production of the CG45 in 1946. He developed a regulator that reduced tank pressure to ambient in a single stage. The simplification to one stage led to a significant reduction in the number of parts and a consequent lowering of the cost of manufacture.¹ This system was based on a venturi system that was triggered by the diver's initial inhalation effort and resulted in a powerful free-flow of air; a flow that would stop with any back pressure, like starting to exhale. He was granted a patent in 1955 for "Open Circuit Breathing Apparatus." This patent resulted in a series of regulators. They were the DX Over-Pressure (1955-1957), the DW Stream Air (1956-57), the Jet Air (two models, DY brown or black phenolic, 1956-57 and the 1020 black cyclac 1961-63), the 1008 Mistral DW (1958-70), and the 1054 Royal Mistral (1965-67).² *[Special note: The serial numbers listed for each model were provided by Mike Ovanessian who has been compiling data on US Divers Regulators for many years. The serial numbers known will be noted in this study in bold italics like this: [30020-36421].*

THE DX OVER-PRESSURE

Characterized by its yellow, riveted nameplate, the DX Over-Pressure was the first of the Gagnan developed single stage regulators.



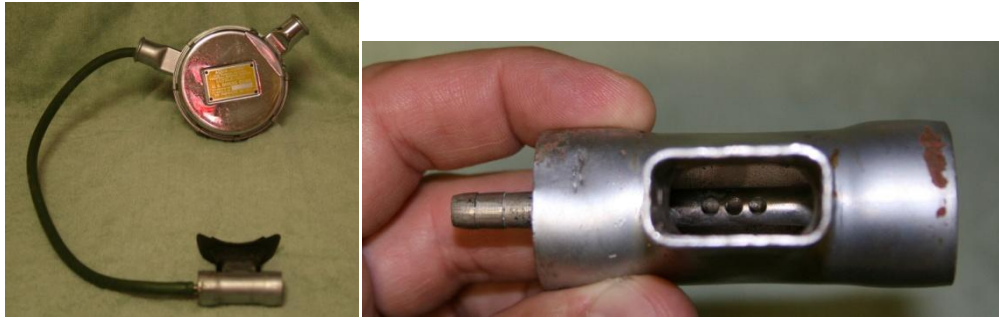
Photo courtesy of M. Ovanessian

The label side can was shiny chrome and the yoke side was satin chrome. Of particular interest, the exhaust horn was removable, the last US Divers model to utilize this feature.

The labels were serial numbered, with some retaining the Broxton Ave address **[30020-36421]** and later ones with the newer West Pico Blvd address **[38090-42760]**.



When the DX Over-Pressure was introduced, the venturi air was piped directly to the mouthpiece via a small tube on the inside of the regulator intake hose. The small diameter hose terminated in a small metal nozzle affixed inside a metal mouthpiece tee. The nozzle or jet pointed directly into the diver's mouthpiece.



Photos courtesy of M. Ovanessian

The chief issue with this arrangement was that the air tended to gush and some divers found this velocity to be objectionable.³ The hose assembly for this early model consisted of separate hoses and a metal mouthpiece.



Photo from Historical Diver⁴

Many DX Over-Pressure regulators were converted by replacing the small hose fitting with a venturi orifice on the regulator body.

Vintage Diver's www.vintagedivers.com



Later models were fitted with black hoses and a straight mouthpiece with black Tinnerman clamps, possibly during the conversion to either the new Mistral venturi nozzle or to upgrade to a mouthpiece with non-return valves.



After the 1008 Mistral DW was introduced in 1958 an upgrade conversion was factory accomplished with the newer Mistral nozzle (1958-1970). (See discussion on 1008 Mistral DW). When this was done a Mistral sticker was attached to the label-side can.



DW STREAM AIR

In 1956 US Divers Corporation introduced the second of its single stage regulators based on Emile Gagnan design. This was the DW Stream Air (1956-57) **[62024-76192]**.



The Stream Air had a new identification plate, red in color and featured two tabs that were inserted in vertical slots in the label can and bent over inside as an attachment.



The use of the venturi nozzle connected to an interior small hose in the Over-Pressure was not widely accepted by divers. So Gagnan devised a different nozzle that allowed the high velocity venturi jet of air to be manageable. By reducing the size of the jet orifice the flow was strong but not excessive. He also rotated the body block so that the nozzle no longer pointed down the center of the inhalation hose, but slightly to one side. By doing so, some of the jet flow began to hit the inside edge of the inhalation horn and caused some of the air to become slightly turbulent inside the cans and helped return the diaphragm to its original position.⁵ The Stream Air was fitted with black hoses, a straight black mouthpiece and Tinnerman clamps. Once the Mistral venturi orifice (nozzle) became available, many Stream Airs were converted and the Mistral sticker was added to the label-side can.



Photo courtesy of K. Gehring

JET AIR (DY and 1020)

In 1956 and again in 1961 a regulator based on the interior mechanism of the Stream Air was marketed. This was the Jet Air. The two versions were basically the same except for case material. The 1956-57 DY Jet Air was constructed of both black and brown phenolic. Phenolic is a synthetic thermosetting resin. The 1961-63 1020 Jet Air case was made of black cyclac. Cyclac is acrylonitrile-butadiene-styrene (ABS) thermoplastic resin.



The DY Jet Air was developed as a rugged, low cost version of the Stream Air. The label was molded into the case.



Photo courtesy of R. VanFrank

Both of the brown and black phenolic Jet Airs used black hoses, straight mouthpiece, and Tinnerman hose clamps.

The 1020 Jet Air was reintroduced in 1961. As a lower cost regulator, it was a particular favorite in diving schools and store rentals. Paired with a 38 cubic foot tank, the resulting junior combination brought scuba diving into the hands of many students.⁶ The 1020 Jet Air used a black and white stick on label.



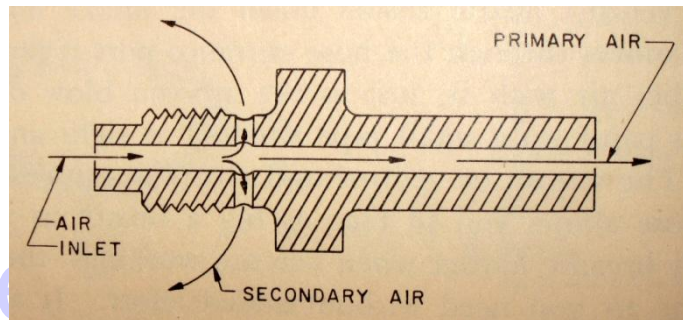
The 1020 Jet Air featured yellow hoses and a straight black mouth piece. The hose clamps were the “improved” nylon clamps. A serial number was stamped into the body washer **[1640-3920]**.



Photo courtesy of M. Ovanessian

THE 1008 MISTRAL DW

Gagnan was not satisfied with the result of his single stage modifications. The DX system with the internal small venturi hose was not adequate, the change to a nozzle of the DW was better, but he wanted a single stage that would, ideally, blow like the wind; less than a hurricane but more like a mistral, a strong wind from the north of France. By changing a set of variables, he was able to produce a regulator that gave abundant air with the slightest effort and shut off instantly when exhalation began.



Drawing from Basic Scuba⁷

This orifice of the Mistral is aimed down the center of the inlet hose. Upon demand by the diver, air enters the orifice from the regulator, the inlet air. The air stream is divided into primary and secondary air streams by venturi holes in the orifice body. Primary air is directed down the intake hose to the diver. Secondary air fills in behind the air leaving the cans and thus air would stop flowing the instant the slightest bit of back pressure was perceived.⁸

The Mistral continued the use of the yellow label like the Over-Pressure. The identification labels help date the regulators as US Divers changed their address of operations. Pico Address Mistrals had serial numbers **[100004-118953]**, Warner Address regulators with short yokes (pre-1967) had numbers **[120065-205758]** and Warner long yokes **[206744-210075]**.



The Mistral was fitted with black hoses, a black, straight mouth piece and Tinnerman hose clamps in 1958. In 1959 the Mistral had yellow hoses, a yellow, straight mouthpiece and yellow Tinnerman clamps.



In 1960 and continuing until 1962, the Mistral had yellow hoses, a black, straight mouthpiece and "improved" nylon hose clamps.



The last series of Mistrals utilized black hoses, the new “Kleer E-Z” mouthpiece and black nylon hose clamps.



In 1967 all US Divers regulators including the Mistral were fitted with a long yoke to accommodate a banjo unit to allow the use of an SPG (submersible pressure gauge).



THE ROYAL MISTRAL

In 1965 the Royal Mistral was introduced [1499-2514]. This regulator had a balancing chamber within its body and provided a more uniform breathing effort throughout the changes in tank pressure. The regulator has shiny chrome cans and an attractive red and gold serial numbered label. The regulator used black hoses, the “Kleer E-Z” mouthpiece and black nylon hose clamps.



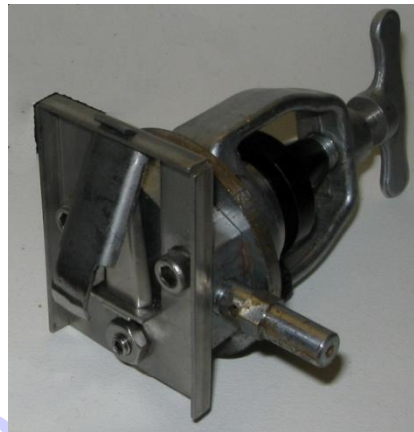
Photo courtesy of M. Ovanessian

Throughout the long 14 year history of the Gagnan-developed single stage Mistral family of regulators, they all utilized a simple but extremely efficient design. The major changes through the years involved the venturi orifice and culminated in the balanced chamber of the Royal Mistral.



Photo courtesy of M. Ovanessian

The Mistral became the largest selling regulator in Europe. One common characteristic of these remarkable mechanisms is the small number of parts. Not counting the cans (either metal or resin) this number is a tiny 20. But yet, the regulators are easy and inexpensive to service and keep tuned. This design has to be considered one of the most significant developments of scuba history.



Vintage Double Hose.com

THE MISTRAL FAMILY



References cited:

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2. Howell, Mark, 2003, A Guide to American Two Hose Aqua-Lung Regulator 1949-1973, Historical Diver, Historical Diving Society, USA, Santa Maria, CA, Volume 11, Issue 1, p. 41.
3. Roberts, Fred M., 1960, Basic Scuba, D. Van Nostrand Company, Inc., Princeton, NJ, pp. 67-68.
4. Nuytten, Phil, 2005, Emile Gagnan and the Aqua-Lung Part 1: 1948-1958, Historical Diver, Historical Diving Society USA, Santa Maria, CA, Volume 13, Issue 1, p. 33.
5. Nuytten, Phil, 2005, ibid., p. 27-28.
6. Nuytten, Phil, 2005, ibid., p. 35.
7. Roberts, Fred M., 1960, ibid., p.68.