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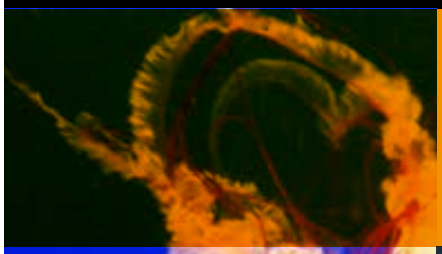
IDM - Integrated Diving Mask

OCEAN REEF NEPTUNE SPACE SPECIALTY COURSE

Diving with a latest-generation full face mask
details, history, technique

Sergio Gamberini



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neptune space

1. Introduction

A mask is the most crucial piece of equipment for learning to dive. It creates a bubble of air between the eyes/nose and the water. Sealing this bubble against the face, a mask creates a "window" through which we can observe what goes on under the surface of the ocean.

From the earliest goggles, masks have evolved adopting increasingly lightweight, durable, comfortable, and moldable materials, in more pleasing and modern shapes. Used for fishing, working, or simply to explore, masks have generally been kept separate from the breathing system, whether this was a snorkel to use on the surface or a dive regulator. In the early years of diving it was fairly normal to use masks that covered the eyes, nose, and mouth, with strange snorkels that had a floating ball in a joint on top to prevent water from entering the mask during the dive. They were cumbersome and relatively uncomfortable during the dive since their volume made them tend to rise toward the surface. However, they did allow divers to breathe through their noses in a physiologically natural way.

The commonly-used conventional masks force divers to breathe unnaturally through the mouth, but their size, light weight, design, and cost amply justify their use. They do not, however, permit another important activity: communication! When a diver must breathe through a mouthpiece and does not have a sufficient volume of air in front of the mouth, this important function becomes impossible.
Nose breathing and the possibility to communicate are special properties offered by the so-called "full face masks", which can be thought of as halfway between a diving helmet and the common dive mask. They isolate the eyes, nose, and mouth, and were originally created to protect the face from cold and pollutants. For many years they were the sole province of the military and commercial divers.

In this book we'll look into the latest generation of masks from OCEAN REEF, introducing the concept of the "integrated mask" and expanding upon all the technical and usage aspects of a product that will likely change the underwater diving technique radically in upcoming years.

2. Divers and the NEPTUNE SYSTEM

By analyzing a diver we can define three major areas:

The lower area, the fins: we call this the **THRUST** area. Everything that moves us underwater can be found in this section: fins, whether rubber or plastic, long or short, with or without channels, and even diving vehicles!

In the middle is the section we call the **PROTECTION and BUOYANCY** section. This area includes the various kinds of suits (wet, dry, neoprene or tri-laminate) and the various classes and types of buoyancy compensator vests. In this area, divers manage their warmth and position in the water.

The upper section is what we call the **BREATHING and OBSERVATION** area. This is basically the diver's head, where we have the MASK and REGULATOR. It is the area that controls the DIVE COMPUTER and LIGHTING SYSTEMS, and is the area that can COMMUNICATE. So, the OCEAN REEF FULL FACE MASK concept was born out of the inspiration to: to create an integrated system, a "container" offering all the functions of the DIVE MASK, a REGULATOR, a COMMUNICATIONS UNIT, a COMPUTER, and helpful accessories like a lighting system.

As we'll see further on, for technical reasons a full face mask must have its own volume which, while clearly necessary, also creates unwanted additional buoyancy lift. To limit this buoyancy lift, we can "fill" this space with appropriately designed elements that integrate system functions to make diving safer and more comfortable.

This concept forms the basis for the idea behind the **NEPTUNE SYSTEM**, which is more than just a full face mask. Rather, it is an **integrated system** that can offer the diver:

- Wide field of vision (mask)
- Comfortable, natural breathing through the nose (regulator)
- Communication with other divers and the surface (communication units)
- Information on dive data (pressure gauges or dive computers)
- Illumination of the surrounding environment without using the hands (light)

BREATHING & OBSERVATION

PROTECTION & BUOYANCY

THRUST

3. A Brief History

The fourth generation saw the addition of an airflow control valve, allowing the regulator to adapt to multiple intermediate pressures as well as for easier operation.

The **earliest full face masks** were simply a downward extension of a conventional mask to cover the mouth. There was no separation (orinasal) between fresh and exhaled air, resulting in an increase in CO2. A conventional regulator was used, connected to special rubber ports by removing the mouthpiece and plugging the mouthpiece base into the appropriate housing. This meant that practically any regulator could be connected. This first generation of masks, with its simple construction, increased the protected area of the face, but it reduced the functionality of the regulator and the safety of the product because of the CO2 that accumulated inside the mask. Nasal breathing was not possible.

The **second generation** of masks preserved the same principle of connecting a conventional regulator to a special opening on the rubber body of the mask, but introduced the concept of the orinasal pocket, or semi-mask. The first connections began to appear that were made especially for microphones, which could be connected to communication units by wires or ultrasonically.

The **third generation** of masks made a significant jump in quality, because instead of connecting any regulator with a mobile connection (not awfully professional), a regulator was designed specifically for this use, and could NOT be used for any purpose other than the full face mask. In the spirit of building a device that was not only protective but also high-performing (such as for breathing), the focus began to grow into dedicated components and the visor began to evolve, starting with the use of lighter and more mechanically durable plastic polymers.

The **fourth generation** of masks took another quality leap forward in terms of the regulator. The regulator was inserted inside the volume of the mask itself, creating a more compact device. It became clear that while expanding the field of vision, it was necessary to avoid bulky protrusions outside the mask, and air bubbles needed to be released symmetrically to improve user comfort. In both the third and fourth generations, inhalation and exhalation were both achieved using a regulator as in a conventional system.

The fourth generation saw the addition of an airflow control valve, allowing the regulator to adapt to multiple intermediate pressures as well as for easier operation.

The **fifth generation** is in truth the ZERO GENERATION: the leap from conventional full face mask to the INTEGRATED mask. OCEAN REEF not only incorporates the regulator into the mask, balancing multiple diver considerations (weight, buoyancy lift, visual field, breathing effort, profiles and bubbles), but the company also strives to incorporate features that are useful, increase safety and make dives more enjoyable. This led to the creation of a series of integrated solutions, such as the frame for using corrective lenses inside the mask, the surface air valve that is built into the mask profile, lights installed in the upper part of the visor and controlled by a switch/battery compartment that is efficiently connected to the SAV, tank pressure and depth displays applied to the sides of the visor, and naturally, various types of communications units. There are even solutions for drinking underwater, as well as other elements that “integrate” into the architecture of the mask.

4. Full face masks
(the elements comprising a “full face” or “integrated” mask)

Now let’s take a closer look into how our OCEAN REEF mask is made.

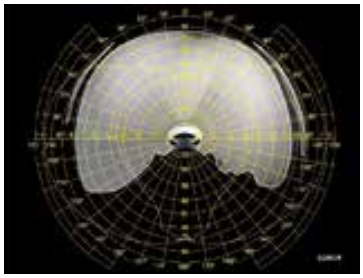
4.1. Visor

This is the part that allows divers to see and explore the underwater world. It was generally made of tempered glass, and is still used on some models currently on the market (Kirby Morgan/Scubapro). Glass is an excellent transmitter of light and is highly resistant to scratches. However, it has lower mechanical durability and cannot be affordably shaped, so it can only be used flat. This means if lateral vision is required or desired, the only option is to create waterproof joints that create breaks in the view, both complicating and weighing down the mask. Shaping glass to achieve curved surfaces would require a melting process at extremely high temperatures, and in any event would not achieve parts that are optically acceptable for underwater use.

The visor on the OCEAN REEF mask is polycarbonate, treated on both sides with a protective scratchproof lacquer that also protects against chemical aggression. The various technical characteristics are listed below, but we can summarize by saying that the mask made of “techno-polymer” (which is a plastic with advanced technical properties). This makes it possible to shape the profile and provides mechanical resistance to impacts that is far superior to glass. This allows us to achieve an excellent field of vision (in which images are clear) that is well defined, and a “perceptive” area that expands the general visual field.

It should be noted that without a mask, in the air, our stereoscopic vision is particularly broad, but only 60 spherical degrees around what we’re looking at can be said to be in optical “focus”. The rest is unfocused perception, but is still essential for human ergonomics. The visor we are de-

scribing has both a very broad field of vision, and perception that noticeably reduces all the blind or cloudy spots that are known as tunnel vision in conventional masks. Mask designs that for physical reasons create tunnel vision have no other option than to draw the glass as near to the eyes as possible to expand the visual field as far as possible.

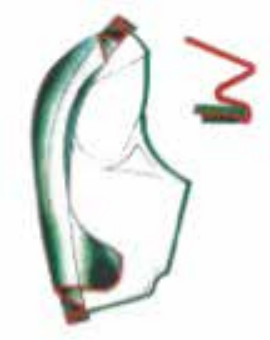


4.1.1. Protective shield

The visor is provided with a protective shield that is removed before use. This shield is then put in place for storage and when transporting the mask.

4.2. The facial sealing system

4.2.1 The face seal



The face seal is another critical feature of any mask, whether conventional, full face, or the latest-generation of integrated models. In the OCEAN REEF model, a patented spring-effect solution has been adopted. The shape of the seal that rests against the face is especially wide and is “S” shaped, acting like a spring that presses continuously and evenly along the face. The evenness of this compression is also guided by several design solutions which convey pressure evenly along the entire contour in contact with the face. This creates a “floating” effect as the seal rests against the face.
Even the material was selected in order to maintain constant elasticity under differing environmental conditions (cold or warm).

Two sizes are available: small/medium and medium/large. A caliper is used to measure two dimensions on the face, and a special table is used to select the size that is best suited for each diver’s face. Two measurements are the distance from below the chin to the upper part of the nose, and the space between the cheekbones. A close-up of the kit and an explanation of how to take these measurements is provided in the “Accessories” section.

4.2.2 Harness and strap

The harness securely fastens the rubber section against the visor, creating the so-called “seal of the mask”. The design ensures that the face seal around the visor compresses consistently. The buckle holders (6 pcs) are positioned approximately 60° from each other and allow the strap to convey its pressure to the face in a very comfortable and dry fashion. In fact, the strap does not exert pressure directly on the rubber section as it does in traditional masks. Instead, acting on the harness, it uses the seal as a spring that

rests on the contours of the face. The strap in turn is not very flexible, precisely so that it can continuously transmit tension to the harness and the rubber body without being subject to excessive stretching or contraction. It is easy to adjust the strap (see below) thanks to the stainless steel buckles and rollers.

4.2.3. Quick release system for the mask

The lower buckle holders feature quick releases that make it fast and easy to remove the mask from your face. There are two models. The classic pull fastened to the buckle holder (G.divers model) or the bolted cross pull. Using different procedures, both allow for quick release of the lower straps and therefore removal of the mask from the face.
In the case of the G.divers pulls, simply feel for them, grab, and pull forward. As the buckle holder bends, it allows the strap to slide through and the mask to be removed very quickly. Then simply lift the mask upward to remove it completely.
The bolted cross pull system (used in the other masks) is removed by pulling forward and then upward with the index and ring fingers, allowing the strap to slide through and the mask to come off.

4.3. Side port (left) for communications unit

On the left side of the mask there is a connector labeled “COMMUNICATION”. It is covered by a removable cap that is screwed down and a flat gasket. The connector leads directly into the orinasal pocket. This is where the microphone, including service and call button, is installed for both wired and wireless units. Once the cap is removed and the flat gasket is safely in its housing, the microphone is inserted from the outside. The screw that supports the small unit is tightened and the microphone is bent into a position that does not interfere with the diver’s lips, checking that the white membrane on the microphone is facing the visor.

Note: Do not over-tighten the PPT on the mask, and always check that the flat gasket is still in place before inserting the unit.

4.4. Side port (right) for surface air valve (SAV) and octopus and accessories

On the right side of the G.divers mask there is a connector labeled SAV/OCTOPUS. It is covered by a screw-on cap with a flat internal gasket. The connector has an internal one-way diaphragm valve. This connector can be attached either to a surface air valve (SAV) or to a fitting that makes it possible to connect a conventional regulator.
SAV - surface air valve. When open, it allows the diver to breathe surrounding air while on the sur-

face with the head out of the water to avoid wasting the air in the tanks. The valve has a rotating cap which unscrews open and screws closed. When the valve is open the regulator does not engage. Remember to close this valve before diving.
In the Space, Raptor, Predator, and Iron Mask models the SAV is a special model already incorporated into the mask. The working principle is similar to what is explained above. In both versions of the mask, the right side port can be completely removed to allow various accessories to be inserted, such as lighting or drinking systems.

4.5. Breathing system

4.5.1. Regulator, balanced and dedicated

The regulator is an integral part of the mask, and is designed specifically for use in this application. It is quite different from conventional models. The physics of a system like this are in fact rather complex, since we are dealing with volumes of air between the air injection nozzle and the lungs as well as varying physical positions assumed by the diver that affect the differences in relative external pressure among the various components of the regulator. We must also consider general aspects such as the option to drain residual water inside and avoid limiting movement of the jaw that is essential for speaking. All of this is very different from the extremely compact spaces of a conventional regulator held between the teeth and used solely for breathing.

Air is managed in the inner mechanical area similarly to a conventional regulator, and then enters from the bottom flowing upward along the visor and thereby eliminating the problem of fogging. Then, through the one-way valve (located on the orinasal pocket) it enters the inner part of the mask and is inhaled by the diver. Exhalations pass through the lower exhaust valve, either fixed or directional. This also makes the mask more effective in cold water, reducing the chance of a regulator freeze since the divers is not exhaling warm moist air into the regulator.

4.5.2. Airflow control

On the other side of the hose connection there is a knob. It works on the mechanism by adjusting the flow of air to the mask. As we'll see below, the diver's position (looking upward, downward, to the side, or upside down) alters the performance of the regulator and thereby changes breathing effort. The diver must use the airflow control to find the right balance. For example, during

the beginning of the dive, it's always advisable to keep the adjustment knob mostly closed. The mask is in fact very sensitive, and in the first few meters overly soft flow from the regulator will manifest as a vibration in the main diaphragm. As you dive, progressively open the flow adjuster to keep the flow consistent.

4.5.3. Dive/Pre-Dive

Alongside the flow adjuster there is a +/- two-position lever called the "Dive/Pre-Dive system"(Space,Raptor,Predator and Iron Mask only) . Moving the lever to the "-" position partially closes the air input opening (you can see this by looking at the regulator from above inside the mechanism. It is a hole measuring approximately 5 mm on the chrome-plated metal body). Reduction of air flow impedes initiation of the Venturi effect, which leads to free flow. This can occur out of the water or due to a sharp blow (generally this happens to a normal second stage when it slaps against the water or another object. The Dive/Pre-Dive positioned on the chin is a "safety" function to eliminate the possibility of spontaneous free flow out of the water. Immediately before the dive, move the lever to "+" to get maximum performance from the regulator. The Dive/Pre-Dive lever is deliberately stiff in order to prevent it from switching accidentally or unintentionally.

4.5.4. Orinasal pocket and air circulation

The orinasal pocket, or "semi-mask", is fastened inside the mask and serves a vital function in the technology of the device: it keeps clean air for inhalation separate from the carbon dioxide and humidity-laden exhaled air. It does so thanks to a good seal in the nose and mouth area, two one-way valves located in the upper part of the orinasal pocket that act on nylon/glass valve housings, and because exhaled air is expelled through the valve below the orinasal pocket itself. When the diver inhales, air enters the mask from the regulator body and ventilates the visor from the bottom up, providing constant anti-fogging action. The air then enters the orinasal pocket through two symmetrical valves located on the pocket itself, and is inhaled by the diver. When the diver exhales, the seal of the orinasal pocket and the two valves do not allow the air to return to the main area of the mask where it originated. Instead, it exits through the exhaust valve at the bottom of the mask. Exhaled air is always very humid, and it tends to condense on colder sections, fogging them. If the visor tends to fog, this may be caused by a poor seal in the orinasal pocket or a malfunction in the valves. If this occurs, it's a good idea to check that each component is assembled correctly. If everything is assembled correctly yet humidity persists, it may be due to heavy evaporation of residual water remaining on the visor (wet mask) compared with low temperatures in the outside environment.

4.5.5. Exhalation valve

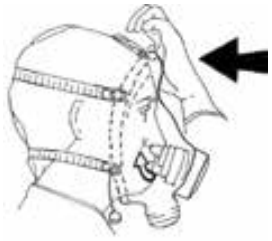
In the lower part of the mask we find the exhaust valve, which can be fixed (G.divers models) or adjustable (Space/Predator/Raptor/Iron Mask models). The air exhaled into the orinasal pocket exits through this valve. Both models feature small holes on the valve manifold and inside that direct any water outside the mask. This is one of the reasons for positioning the air exhaust valve

independently instead of keeping it on the regulator. The directional valve has 4 positions that allow the diver to exhale on both sides, keeping bubbles away from the front visor, on a single side (for example when you do not want the bubbles to interfere with a communications unit), or to close the valve (though not completely), making it possible to assume a head-down position without bothersome spontaneous free flow triggered by the change in external pressure between the exhaust valve and the regulator. It is generally necessary to adjust the flow in advance and find the correct balance that achieves efficient operations without wasting air.

4.6. Equalizing

Because the visor is rigid, divers cannot access their noses to simply squeeze with their fingers as they would in a conventional mask. The mask has an adjustable internal equalizing system that consists of silicone blocks fastened to adjustable supports, allowing divers to block their nostrils pushing back on the top of the visor (see details below). The base for the blocks can be adjusted in three directions to adapt the system to different nose and face shapes.The equalizing system must not obstruct the nose in any way during the dive, and should only work when necessary. This allows breathing and conversation to proceed normally without adverse effect (speaking with a blocked nose is uncomfortable and changes your tone of voice!)

The equalizing frame can be raised or lowered perpendicularly to the mask using a screwdriver. The silicone blocks can be moved nearer to or farther from the nose (WITHOUT INTERFERING WHEN NOT IN USE) using the appropriate size of insert (provided with the mask, in three sizes: 3, 6, and 10 mm) on the seats where the silicone blocks are placed. The inserts bring the blocks closer to the nose. This can be useful not only for people with flatter noses, but also for those who wear the mask over a wetsuit hood, thereby distancing the mask (and the equalizing system along with it) from the face. The inserts bring the equalizing block to a manageable position. Finally, the blocks can be rotated like cams on the pin to which they are fastened, allowing them to be arranged closer together or father apart depending on the shape of the nose.



4.7. LP Hose and 1st stage

The low pressure hose (LP) connects the mask to the 1st stage with standardized fittings and lengths. The 1st stage used for CE Certification is the OCEAN REEF SL 35TX with INT or DIN 300 bar fitting. The integrated mask functions best at an interstage pressure of 9.5 - 9.8 bar.

5. Accessories

5.1. Quick and swivel connectors

Quick connect hose. This device makes it fast and easy to connect and disconnect the mask to and from the 1st stage (start/end of dive, transport, replacement, etc.). The hose is connected to the 1st stage using a standard LP fitting and is available in 800 and 1200 mm versions, as well as two types of quick connections.

Swivel connection. This connection is used to direct the hose connected to the mask to the diver's preference and increases its maneuverability. However, any type of intermediate connector will reduce airflow capacity. This must be taken into consideration when used. The swivel connection can be used with the quick connect hose.

5.2. Corrective lenses

Removable corrective lenses may be installed in the mask. The frame for the corrective lenses is designed like common glasses, with two guides instead of arms. The guides are inserted into grooves in the face seal, holding the frame steady inside the mask with the help of the orinasal pocket. Personalized lenses can be inserted by an optician just as for any pair of glasses, allowing users to choose the gradations and characteristics they want.

5.3. Integrated visor lights

The integration of a lighting system is one of the elements that best exemplifies the concept of an integrated mask. The VISOR LIGHT is a light consisting of 6 powerful LEDs positioned in the mask visor and controlled by a switch installed on the SAV or OCTOPUS port. Installation of visor lights does not interfere with the diver's use of the surface air valve. The light creates a 12-degree oval beam focused right in front of the mask, with a 75 lumen output and burn time of nearly 3 hours.

5.4. SDVL (depth/pressure gauge)

SDVL stands for Shield Display & Visor Light. This accessory integrates a depth and pressure gauge into the mask in addition to the lighting system. These two crucial indicators are displayed by LED bars placed on the sides of the visor, so they do not reduce the visual field. These LED bars consist of two sequences. One shows the tank status (greed LEDs that go out progressively as the air is used up) and the other displays a depth reference (blue, yellow, and red LEDs that switch on as depth increases). This provides a simple, immediate view of certain crucial information about the dive, as well as access to a built-in light, while still preserving the SAV. The SDVL is controlled by a processor attached to the tanks.

5.5. Octopus adaptor

In masks where the SAV (surface air valve) is NOT included, a fitting can be attached for a conventional 2nd stage. This connector is screwed into the SAV/OCTOPUS port on one end and to the second stage regulator on the other, removing the mouthpiece. This can also be done on masks with built-in SAV, however a simple replacement of the connector on the mask is required. This is an operation that should always be performed by specialized personnel.
This adaptor is available in two sizes to fit most regulator models.

5.6. Measuring kit for choosing the best size

To select the best mask size, a kit is provided that contains a measuring tool (caliper) and a table indicating the distance between the chin and the top of the nose and the distance between the cheekbones.
The table shows which size works best for each face size, minimizing possible leaks.

5.7. Drinking Device

The drinking device consists of a straw and a valve connected to the right side port (SAV/OCTOPUS) on the mask, and can be connected to a pouch containing liquid. The connection between the pouch and the drinking system is a quick connector, and pouches can be changed during the dive. A

small folding valve opens the connection between the pouch and the drinking device. Simply apply light pressure to the pouch after taking the straw in your mouth inside the mask to easily drink its contents.

5.8. DDR – Dive Data Recorder

The DDR records the activity of the mask from the moment it is installed until its internal battery runs out (on average 5 years!). It can be installed on the mask upon request. It occupies very little space and requires no manual activation or special care in terms of maintenance. Any time the mask enters the water and descends below 2 meters the DDR switches on and begins recording the dive date and time, duration, temperature, and depth. When the dive is over it returns to its dormant state and stores all the recorded data in its memory. It is extremely useful, not only for recording the actual product use and stress it has undergone, but also for calculating the required maintenance. Users can enter a portion of the data extracted from their DDR into an algorithm, published on the OCEAN REEF website, in order to determine the appropriate maintenance schedule. The DDR features an interface so that users can download all dive data and profiles to their own computers.

6. Communications Systems

The left side port on the mask called COMMUNICATION is dedicated to connecting the microphone and the main controls for the communication unit. Once the screw-on cap is removed, a microphone can be inserted and the activation controls for the transmitter functions can be screwed in. This part is often called a PTT (push to talk), referring to a simple system consisting of a button that allows for transmission when pressed. There can be up to two controls, in the form of buttons to operate the volume, automatic transmission, channel changing, etc. From the PTT a cable leads to the transceiver unit, which can be connected to the mask using a special support called the NACS (attached using two pins located on the harness). The tranceiver can also be hooked to the buoyancy compensator vest, separating it from the reception speaker mounted on the helmet or hood. If mounted on the NACS, the communication unit includes the speaker for listening. The communication unit is generally self-powered, combining compact size, light weight, autonomy, and extensive transmission range. Our manual on underwater communications provides a full description of communication systems and underwater communications technology.

Other communication systems can also be used including wired, ultrasound, hybrid systems, and systems offering video by using a waterproof camera mounted on the mask harness.

7. When and Why to Use a Full Face Mask

Instead of asking yourself, “Why dive using a full face or integrated mask”, perhaps you should be asking, “Why not?” Sometimes conservativism can obscure advantages that would substantially improve our activities. We are resistant to change… yet if we open our minds we realize, For both experts and beginners, it’s tradition to use a conventional mask with the regulator held between the teeth and breathe through the mouth. It’s standard practice to teach beginning divers using these tools. Basically, three simple arguments justify the use of a full face or integrated mask.

- Breathing through the nose like Mother nature taught us.
- Protecting ourselves from the cold. We already do it with increasingly sophisticated suits – why leave our most delicate areas exposed to the cold?
- Communicating by talking. It’s one of the most obvious natural actions of a human being. In addition to practical reasons, communication also increases safety.

Nonetheless, these reasons are sometimes not sufficient, and a more in depth examination is required.

A recent survey conducted over the internet demonstrated that over 70% of beginners experience initial discomfort when diving and breathing through their mouths with a conventional regulator. A certain percentage is afraid of losing the regulator, and as a consequence clench their teeth around the mouthpiece so tightly that they fatigue their facial muscles. Some even give up diving for this reason, although most people continue and adapt. Conventional masks are lightweight, can be put on quickly, and after an initial shock, regulators fully satisfy a diver’s demand for air. On the surface, you can free yourself

from your mask and regulator in seconds; these crucial points push the discomfort into the back of the mind (cold, unnatural breathing…). What's more, for people who are rooted in the classic concept of diving (even a bit "militant" and "aristocratic"), speaking underwater would be "breaking the ideal of underwater silence")!The reality is that everything has its place, and like always, an open and receptive point of view (even a bit revolutionary) is what leads to true evolution.

So, we should ask ourselves, "why do we dive"? If you dive for work there are very specific requirements and equipment must be chosen and designed for that specific purpose, for example to protect yourself from the cold, from pollution, and/or to work safely and comfortably. Professional, recreational and technical divers select their equipment the exact same way and based on the same rules.

According to the OCEAN REEF concept, an **INTEGRATED** mask should be used when:

- you want to breathe naturally through your nose rather than your mouth
- you want the freedom of having nothing clenched between your teeth and you want to communicate underwater
- you want to increase thermal protection for your face
- you want to increase your field of vision
- you want to integrate multiple functions such as lighting, dive information, breathing, and communications in a single, compact element

When making this choice, it's crucial to get plenty of information and evaluate the features evenly and fairly. For example, an integrated mask is larger and heavier than a conventional one: true! But it also integrates a regulator second stage and spaces dedicated to accessories that could not otherwise be so conveniently integrated with a conventional mask.
It's visually more complex, and seems more difficult to use: true! It seems but it isn't! Aggregating multiple elements by definition seems more sophisticated and complicated, but it's all proportional to the opportunities that using these elements deliver.
There are two classic questions that are always asked about a full face mask:

- What happens if it floods?
- What do I do if the regulator breaks?

An OCEAN REEF integrated mask cannot flood like a conventional mask. With a traditional mask there is always a pressure difference between the outside and the inside, therefore it's relatively easy to flood the mask. But in the case of an INTEGRATED OCEAN REEF mask, the internal pressure always balances to the external pressure, every time you breathe. To flood the mask you would have to take it off your face!

If the second stage breaks or you run out of air in conventional diving it's relatively easy to switch to an alternate source, and because the mask is separate from the regulator it is not involved. With an integrated mask, options for replacing the air source are different, but they still exist (See exercises you should know – Section 9) and require the same level of preparation and education.

In truth, one system is NOT an alternative to the other. Both have applications that depend on the subjective needs of each activity, and as always, it's advisable to understand both techniques so you can handle any situation.

It's definitely a mistake to rely on preconceived notions and not to expand your understanding. Let's not forget what happened with buoyancy compensator vests, or with dive computers, or more recently with dry suits.

8. Using the Mask

8.1 Preparation

For any dive to succeed, it is necessary to prepare all equipment properly.

1. Check that the mask has not been tampered with, and has no broken or missing parts.

2. Customize the equalization system: This operation can take up to 5 or 10 min. (first time only), because it must allow the diver to equalize comfortably and safely. This can entail donning and doffing the mask multiple times. Once the system has been adjusted properly you won't need to "waste" these precious minutes for subsequent dives. To begin, for convenience sake move the harness to the front of the mask so you can quickly bring it up to your face over and over. The adjustment must allow you to keep your nose free under normal breathing conditions, and whenever you push the forehead or front of the mask against your face, it must fully block your nostrils so that you can equalize your ears. When the adjustment is complete, return the strap to its natural position and run a final test by putting the mask on completely as if to begin a dive. If the results are unsatisfactory you'll have to start over.

3. Check operation of

   a. Regulator adjustment knob – rotation in both directions
   b. Dive/Pre-Dive – rotation
   c. SAV surface air valve, open/closed, attachment to the mask
   d. Exhaust valve (if adjustable, check all four positions)
   e. Functionality of the various connected accessories
   f. Connection to the first stage, check that the hose is screwed on properly
   g. Regulator purge button, press to check the regulator is activated
   h. Straps slide through the buckles

8.2 Donning and doffing the mask

Putting on the mask correctly is the second crucial step in the success of the dive. A mask worn incorrectly makes the dive unpleasant and causes leaks of air, discomfort in the jaw, excessive vibrations, and fatigue in the neck.
The correct procedure for putting on the mask is the following:

1. Check that the tank is open and the mask is connected.
2. Check that the straps are all at maximum length.
3. Put on the mask, and if installed, make sure that the surface air valve (SAV) is open to allow air to pass.
4. Pull the central portion of the harness all the way down to the nape of your neck.
5. Adjust the six side straps beginning from with those in the middle, then the ones on the bottom, and ending with the top two straps.
6. With the low-pressure hose connected, press the second stage purge button and check that air flows freely.
7. Release the button and make sure that the flow of air stops.
8. Close the surface air valve (if installed) before descending.

8.3 Donning the mask with a hood

The hood must always be put on before the mask.
The mask can be worn with the face seal both over or under the hood. Keep in mind that if you wear it over, the seal will press against the material/fabric of the hood. If this material has any nicks or gaps, they can become channels for air leaks that will increase consumption. It's preferable to use a hood with a smooth neoprene exterior that is free of stitching running underneath the mask seal.
If the mask is worn under the hood, you must keep in mind that it's possible for a small amount of air to filter from the seal and end up inside the hood, inflating it. This phenomenon is well known by suit manufacturers, who often include a small exhaust valve on top of the hood. If your hood does not feature this valve, it's advisable to install one before using it with the mask.

8.4 Regulator sensitivity and consumption

Sensitivity
Regulators are especially sensitive to changes in the diver's position in the water and to pressure. In shallow water (within 2-3 meters), if the adjustment knob is too open, you'll notice a vibration every time you inhale. Simply turn the flow adjustment knob gently to eliminate this vibration,

which is caused by the high sensitivity of the regulator combined with the physics of the mask (internal air volume and distance of the regulator body from your mouth).

Air consumption
People mistakenly think that the volume of the mask is correlated to air consumption. The bigger it is the more you consume. Wrong! Consumption is determined by other factors. If you think about it, regardless of the volume of your mask, the air you inhale from the tank is equal to the volume that your lungs are able to draw in. Whether you're wearing a full face mask or using a conventional regulator, your lungs are always the same! However, consumption can and does vary according to certain factors.

Speaking results in higher consumption, of up to 15 to 20%. That's reasonable, thinking about how you breathe when you speak.
Switching from one breathing method to another requires you to adapt, and people who breathe through their mouths tend to consume more at the beginning. However, after a bit of experience, it's even possible for you to reduce your consumption compared to conventional masks.

8.5 Body Position and Effects on Regulator Sensitivity

The sensitivity of the regulator changes depending on the diver's relative position in the water. It becomes stiffer when you look upward, and softens when you look downward, like any regulator. In addition, exhalation effort is slightly higher when maintaining an upright position, while there is a tendency for free flow to occur when you're in a head-down position and the exhalation valve is higher than the regulator.

8.6 Breathing

Breathing through the nose is absolutely natural for all of us, but it can feel a little strange when you've been trained to use normal mouthpieces and regulators. The first time it can even seem a little unsettling to keep your mouth closed and breathe through your nose, but you'll get used to it right away. The breathing technique is very similar to the conventional technique; inhale, brief apnea, and exhale. It's incredibly pleasant to breathe so normally. Still, nothing's stopping you from breathing through your mouth as well if you like.

8.7 Equalizing Pressure in the Mask

With each breath the mask balances its own internal pressure with the outside pressure, so the mask squeeze effect (a common problem in traditional masks) cannot happen with an integrated mask.

8.8 Buoyancy Lift and Weight of the Mask

This is a truly important concept to keep in mind when using full face or integrated masks.

1. These masks have a slightly higher volume than conventional masks.
2. They are also heavier because they integrate the regulator, which would otherwise be counted separately.
3. It can be helpful to increase your weights by approximately 500 grams (1 lb) to compensate for the buoyancy lift added by using an OCEAN REEF mask (other models require much more weight).

There are two requirements that must be satisfied to use it comfortably.

a. The weight must be contained to ensure that transport and use out of the water is not stressful or bothersome.
b. The volume creates buoyancy lift underwater, which must be as low as possible to reduce upward compression on the chin from below, which can create a sensation that your mask is falling off and can tire the muscles in your neck.

Older models offered lead inserts to compensate for the strong buoyancy lift, but as soon as the diver exited the water the mask became heavy and uncomfortable. Current technology focuses on filling the volume of the mask with functional parts that have specific weights that are as neutral as possible, in order to avoid weighing down the product while still decreasing the lift volume.

8.9 Defogging and Fogging in the Visor

While in conventional masks anti-fogging strategies were used for the inside of the glass, in an **INTEGRATED** OCEAN REEF mask defogging is achieved thanks to the circulation of air described previously.

We should however mention certain situations that we've learned to handle through experience.

Especially Cold Water
During dives in particularly cold water, the difference in temperature between the face and the water surrounding the mask can be as high as 30 or more degrees. If the mask is wet inside or the face is damp, this wide temperature gap will cause the humidity to condense on the inside of the visor. There are two solutions to this problem.
Keep the inside of the mask and the face dry, in order to eliminate the formation of humidity.
Hold down the purge button on the regulator to "cool" the inside of the visor. However this solution is only temporary. It is always better to keep the inside of the mask as dry as possible.
In any event you can still spritz the inside of the visor with anti-fogging solutions.

Leaks inside the mask

Under normal conditions, fogging indicates leaks, which are almost always caused by a poor seal of the orinasal pocket against the face or the valve itself. It is also possible that the orinasal pocket is not seated correctly or that the fastenings for the exhaust valve or the communications unit have come loose. Regardless, it is always a good idea to check the mask prior to the dive to eliminate this problem. Don't forget that in addition to humidity, CO2 also enters through these leaks. That's exactly what we want to avoid!

8.10 Entering the Water

Entering the water from shore is done just as you would while wearing a traditional mask. Using the quick coupler, you can hold the mask in your hand, make the connection shortly before, and then put it on.
When you enter the water from a boat or pier with a traditional mask, it's always a good idea to steady the mask with one hand to avoid losing it when you hit the water. With a full face mask this problem is very unlikely to occur, but it's still a good idea to put a hand on the regulator and hold the mask firmly.

8.11 How to descend

As you descend, it's a good idea to assume the most comfortable position. In general, breathing is most comfortable with your head up and your feet down. Descending with your head downward can cause free flow and tire your neck. You should equalize pressure using the procedure described previously, pressing the upper section of the visor or pushing the mask upward from the regulator. Both methods push back the equalizing device to close your nostrils.

8.12. Correct head position with an integrated mask

There are no special differences compared to using conventional equipment.

8.13. How to exit the water

When you reach the surface, it's worth taking a second to open the SAV (when it's particularly cold and you don't wish to remove your mask), or to take the mask off entirely, leaving it attached to the hose.

9. Exercises You Should Know

All these exercises should be done first in the pool or confined area and then repeated in an open water environment.

9.1. Surface Air Valve – Octopus Connection

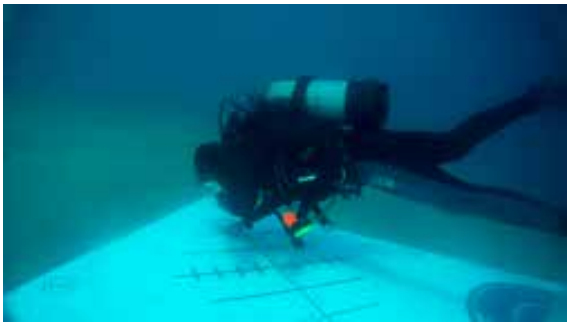
- Make sure that the mask has a SAV installed (surface air valve).
- Check that the valve works, opening and closing easily. You should not have to overexert it to open or close the valve.
- With the regulator connected to the tank and the air valve open, put on the mask, checking that air flows regularly.
- Open the SAV. The regulator should stop delivering air and you should be able to breathe comfortably through the valve.
- Reach your entry point with your mask on and the valve open. Some fogging in the visor is possible and normal. It can be removed easily by pressing the purge button on your regulator to blow a little air over the visor.
- Before entering the water, close the SAV. Do NOT twist too hard when closing the valve. It is sufficiently closed when the regulator begins working.

9.2. Different Positions and Head-Down Position

There are six positions a diver assumes.

a. **standing**, on your feet or knees looking forward (reference position).

b. **swimming**, horizontal and looking downward (the mask will be softer than “a”).



c. **sleeping**, horizontal and looking upward (the mask will be harder than “a”).

d. **r side**, horizontal and looking to the right (like “a” but exhaling is easier).

e. **l side**, horizontal and looking to the left (like “a” but exhaling is easier).

f. **down/under**, with your head down and your feet up (the mask will start to free flow spontaneously from the exhaust valve. Close the valve and use the flow adjuster until the leak stops. Adjust your breathing).

In the first exercise, begin in the standing position, move to the swimming position, and return. During this movement, use the flow knob to find the most comfortable adjustment.
Then, assume each of the six positions listed above, testing the adjustment and the regulator’s “response”. In the “down/under” position, use the regulator adjustment, your own breathing, and the exhaust valve to find a balance WITHOUT spontaneous free flow and with easy breathing.

9.3. Flooding and Clearing the Mask

a. Inhale.
b. Pull the mask away from the face by releasing the lower straps. Partially flood the mask. Then put the facial seal back in place, ensuring that it is seated well, especially along the upper edge, and gently press the regulator button. The water inside the visor will drop progressively.

c. Repeat the operation, completely flooding the mask and pressing the regulator button until the full volume is empty again. In both cases, the operation should be done slowly to clearly understand how the mechanism functions.

d. Repeat the steps “b” and “c”, trying to empty the mask only by exhaling, without pressing the regulator button.
e. Readjust the lower straps.

Further Flooding Tests

1. Try to let water into the mask by slipping your fingers under the facial seal on your forehead. The air rises, the regulator opens, and the flow of air prevents water from entering (at most just a few drops will enter).

2. Try opening the SAV underwater to see what happens, so you can recognize the problem should you forget to close the valve before the dive. You will feel a slow water leaka.

9.4. Removing and Replacing the Mask Underwater

a. Before removing the mask make sure you have an emergency octopus available.
b. Kneel on the seabed.
c. Inhale
d. Remove the mask by gripping the quick release tabs and pulling forward. Then lift the mask and slip it off your face to the right.

e. Breathe from the octopus and wait a few seconds without a mask.

f. Hold the mask by the regulator with your right hand. Then with your left hand, run your thumb inside the facial seal until you find the central connection point for the harness.

g. Release the octopus and put on the mask, pulling the straps behind the nape of your neck and checking that the center of the straps is slightly below it.

h. Keeping the mask on your face, press the regulator button to empty the mask of water.

i. Adjust and tighten the middle straps so that the mask fits comfortably on your face.
j. Finish clearing the mask (if necessary).
k. Check that the straps are flat against your head without folds.
l. Tighten the straps on the bottom of the mask.
m. Tighten the straps on the top of the mask, making sure they're not overly tight (this can pull the mask too far upward, reducing comfort and seal).

It's a good idea to repeat the operation, this time clearing the mask by exhaling, without using the regulator.
With the mask removed, also try to lengthen all the straps to fully adjust each strap. For even more complete preparation, you can also practice:

- put on - clear - adjust
- put on - adjust - clear
- Same exercises while wearing a hood

9.5. Switching From a Full Face Mask to a Conventional Mask and Regulator

Follow the operations above under point "e".

a. Put on the conventional mask and clear it as you were taught by your training agency.

9.6. Alternative air assistance using Octopus with a quick connection

This procedure requires the diver to have an octopus attached to a **hose by a quick connection identical to the one used on the mask**.

By simulating an "out of air" scenario, divers follow the standard conventional procedures, and:

1. The assisting diver removes the octopus from the quick-connect hose and signals this operation to the other diver by showing him or her the hose with the free quick coupler.

2. The diver who is running out of air inhales and removes his or her hose from the mask.

3. The assisting diver attaches his or her hose to the mask of the diver who needs air.

(Ascent procedures are the same as standard procedures).

10. Tips on Mask Maintenance

Like all diving equipment, full face masks require care and maintenance.

1. After the dive, rinse the mask with fresh water, and if possible soak it in fresh running water for a few minutes. Leave it to dry, re-mount the protective shield and place the mask back in the provided storage bag.
2. Periodically check the O-rings to be sure they are present and in good condition. Those on the two side ports are especially important. Check the movement of the exhaust valve, the flow adjustment system, the surface air valve (SAV), and the dive/pre-dive switch. If the parts are too stiff or stuck, contact a service center and do not dive with the mask.
3. If the mask is also used by other divers, wash it thoroughly and disinfect the parts that come into contact with the nose and mouth. Check the manufacturer's recommendations for this operation.
4. Once a year, the mask should be overhauled at an authorized center to fully inspect and maintain all moving parts. If the mask features a DDR, use the internet service to check whether maintenance is required.

Conclusion

Evolution is a dynamic search for more powerful equilibriums that can improve our lives!

Integrated masks are a crucial tool in the evolution of diving, and their purpose is to increase comfort and safety. As with all new concepts, a curious and positive approach will make learning faster and more effective. It also helps refine ideas and allows evolution to continue. We conclude this manual with this hope and an invitation. Suggestions and critiques from enthusiastic divers will help us improve our products and continue to open new frontiers of development in modern diving.

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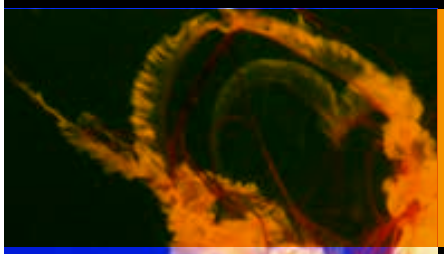

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