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SAFETY GUIDELINES AND PROCEDURES

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CMAS Safety and logistics guidelines for international competition.

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2 List of minimum requirements for international CMAS competition

2.1 Logistics

- Boat or ponton with bow to install competition line.
 - The pontoon or deck boat should be sufficiently large to welcome judges, camera operators and emergency team with equipment
- Counter balance, electric or manual winch system to pull up all the competition line at a minimum speed.
- Diver recall system. In case of activation of counterweight or electric winch system, a signal will be emitted so that athlete can grab the line to ascent.
- Sonar system to follow the descent and ascent of the athlete during his performance
- Video system
 - Underwater drone (ex: diveye) following the athlete during all the performance.
 - Depth camera to monitor turn and retrieval of the tag
 - Surface cameras to record start and surface exit protocol.
- One evacuation boat ready to send a freediver in need to the closest hospital according to the evacuation plan
- 2 training buoys set at a depth of 40m and equipped with a quick retrieval manual system (pulley of other mechanical system)
- Accoustic system – diver recall system

2.2 Competition personnel

- Main judge
 - Head of logistical coordination with the help of competition organizer
 - Organize start list with the help of competition secretary
 - Give orders for releasing of counterweight or activation of electric winch
 - Validate the results
- Safety chief
 - Head of safety team
- Competition secretary
 - Assist judges for processing results
- Surface judges
 - Validate surface protocol and validity of the attempt
- Sonar technician
 - One person per competition line.
 - Manage reading and calling of athlete depths via sonar
- Surface Camera operator
 - Manage the official cameras to record surface and exit protocols
 - Download footage daily for judges

- Charges all batteries and transport equipment to and from the divesite
- In depth camera operator
 - Manage the official cameras to record the underwater videos
 - Download footage daily for judges
 - Charges all batteries and transport equipment to and from the divesite
- Live camera operator
 - Manage the official cameras to record the live videos from competition
 - Download footage daily for judges
 - Deal with live streaming of the competition
 - Charges all batteries and transport equipment to and from the divesite
- Line coordinator
 - Changes line depth
 - Manage daily dives list and communicate informations to judges and safety
 - Deploy counter balance or launch electric winch on the order of main judge
- Safety freediver team composed of 5 freedivers (In long competition, team change must be schedule every 3h)
 - 1 freediver with underwater scooter
 - 2 safety freedivers with long fins and divesuits to avoid hypothermia
 - 2 in reserve, ready to dive to replace any other s a f e t y f r e e d i v e r
- Emergency unit located on the competition boat
 - Doctor with CPR certification
 - Medical assistant
- Training buoy safety
 - One safety freediver per buoy (minimum 40m freediver)

3 LOGISTICS

3.1 Deck boat or pontoon

The pontoon or deck boat should be sufficiently large to welcome judges, camera operators and emergency team with equipment

3.2 Competition line

Competition line must be marked every 10 meters.

Safety freedivers will dive to the first mark underwater and read personal gauge to verify the setting of the line before the attempt.

3.3 Recovery systems

The counterbalance, electric or manual winch, is a safety system designed to retrieve an athlete beyond reach of safety divers. It exists multiple design for these systems but it is mandatory to achieve at least a speed of ascent of minimum 1m/s when the freediver is dragged by the lanyard from a depth of minimum 80 meters.

Attention must be paid to the drag exerted by the bottom plate and the freediver himself (in particular when the lanyard is worn at the belt).

A minimum distance of 6 meters is recommended between counterbalance line and competition line to limit crossing issues.

Speed of ascent of recovery system will be assessed by safety team during the training practice in competition real conditions. In particular the time of ascent of the system will be determined from a depth higher than 80 meters, during the ascent safety freedivers will dive successfully to 20 meters and grab the competition line to simulate the presence of the athlete.

3.3.1 Type of recovery systems

3.3.1.1 Uneven Ballast

Counterbalance system designed using a larger weight on the opposite side of the competition side of the line. The uneven Ballast should be at least twice the weight of the competition side of the line.

Pro : All that is required is a simple pull on the line and release of the clutch system to activate.

Con : This system makes changing line depths more difficult as one side is pulling harder than the other. In case of current at depth and differential drag of the two ends, it can induce crossing of the two ends.

3.3.1.2 Drop Weight

Counterbalance system that uses equal weights on both the counterbalance and competition sides of the line and utilizes an additional weight that is only deployed in the event of an activation of the system. Drop weight should bring the total weight of counterbalance to at least twice the weight of the competition zone.

The Prusik is a knot used to attach a drop weight. The reason we use this particular knot is that when the weight is dropped, it immediately catches the line which allows the weight to immediately begin assisting the line down without having to fall the entire length of the line before catching the line.

3.3.1.3 Electric winch

Electric winch is a mechanical rolling system connected to an electrical motor. It allows to adjust finely the depth of the line but also to recover the freediver without any effort when activated.

The electrical motor should be connected to an independant power supply. (live streaming cameras should not be powered on the same source in particular as it can reduce the speed of ascent of the line)

3.3.1.4 Manual recovery

In case of power failure, or catastrophic mechanical failure, the line should be ascended manually with a trained team at a sufficient speed (>1m/s)

3.3.2 When to activate recovery system

The recovery system should be activated if

- Motionless athlete is either visible by safety team, live cameras or visible with sonar (With sonar, the system will activated if we see a stop of at least 10s, a stop is considered as a speed of descent or ascent of less than 0.2m/s).
- The athletes touches the bottom at least 30s late according to bottom dive time declared at the beginning of the competition.
- The athlete is not in sight of the safety freedivers at the end of the announced dive time.

The safety diver initiated activation should be done at the discretion of the safety divers at depth. If the athlete appears to be unconscious or not progressing then activation should be signaled.

The signal is a full arms extended waving overhead and should be horizontal in reference to the surface so that the signal can easily be seen at depth from the surface (FLY MODE). Additional safeties should be placed within sight of the surface as needed if visibility issues are present at dive sight.

Upon activation, an accoustic signal must be used to inform athlete and safety divers that the recovery system has been activated.

3.4 Lanyard

All personal lanyards must be between 80cm and 150cm long and weight less than 500g. The main judge of the competition will systematically check the lanyard during technical meetings (low quality velcro, carabiner difficult opening will not be accepted).

3.5 Sonar system

Sonar is a fairly reliable means of keeping tabs on an athlete during a dive and it is a recommended piece of equipment when organizing an event. The following is a list of specifications a sonar should possess for proper following of a freediving athlete:

- Must be a minimum 600 watt transducer. Transducer should be located within 6 meters of the competition line.
- Have an "A-scope" feature.
- Additional: A deep cycle 12 volt battery with minimum 75 amp hour storage recommended and should be charged if voltage drops below 12.1 volts.

When an underwater drone is used to follow the athlete during descent and ascent, the signal read on the sonar system is likely to be the drone signal rather than the athlete one as the drone is mainly composed of metallic parts. In that case, it is recommended that the drone follow the athlete at the same depth.

4 COMPETITION PERSONNEL

The roles of main judge, competition secretary and surface judges are listed in the CMAS competition rules document available on www.cmas.org website.

4.1 Sonar technician

The sonar technician is an extremely important position on the safety team and he or she should be experienced in that position. He or she is the eyes of the team at depth and can in fact save a life.

The following is a list of task associated with the Sonar Technician Roles:

- Verbally call out depths of athlete every 10 meters beginning at 30 meters depth.
- Report “touchdowns” and “turns” to the team.
- Sonar technician is responsible for reporting delays or pauses in the movement of an athlete. If an athlete fails to progress after 10 seconds, a call for the activation of the counter balance is recommended.

4.2 Line coordinator

- Adjust the setting of the line between dives.
- Verify depth by answering back the verbal acknowledgement of depth from the safety divers. Visually verifying markings above the surface as the line is being repositioned. This check should be done during both training and competition and additionally checked by a member of the judge team during competition.
- Ready and in position near counterbalance system or electric winch so that activation can be quick and efficient if activation is asked by the main judge.
- Maintain a clear area around the counterbalance system. Once counterbalance is activated the line coordinator will assist the line up by pulling as fast as possible.

4.3 Emergency Unit

4.3.1 Medical Team

The medical assistance must guarantee the first aid interventions to those who suffer accidents by giving them the aid necessary from the beginning of the accident until the re-establishment of conditions of health in the local health facilities. Communication of medical assistance team to the doctor of local health facilities shall include the causes and circumstances of the accident occurring at the athlete.

The medical assistants are appointed by the Organizing Committee and they are responsible for controlling the event at the medical level. The medical team is made up of:

- One doctor (MD) who must be skilled, experienced, equipped and capable to perform CPR (cardio-pulmonary resuscitation) as well as to provide first aid, who is responsible for the competition and is always present in the competition area,

- An ambulance reserved for the competition area, with a doctor on board, which must be located on land, close to the Health Centre
- An official hospital facility which must be easily accessible for the ambulance and aware of the evacuation plan of the competition

4.3.2 List of medical equipment

- Bag Valve Mask
- Double Evacuation Time supply of 100% Medical Grade Oxygen
- Oral Pharyngeal Airway Multiple Size Kit
- Advanced Airway Kit
- Manual Suction
- AED

4.3.3 Evacuation Plan

An evacuation plan is almost as important as the doctor and should be well thought out and practiced to avoid confusion in an emergency situation. The evacuation plan should be extremely detailed to include a detailed route map, phone numbers to hospitals and ambulance services. Driving times from extraction site to advanced hospital care should be measured accurately and listed on the evacuation plan as well as alternative routes.

4.3.4 Evacuation boat

A dedicated evacuation boat should be on site at all times before and during competition and at least two dedicated operators should be assigned to the boat. The boat should be able to carry 5 personal to include the captain as well as an evacuation supply of oxygen. Additional oxygen should be stored on board the evacuation boat. A dedicated phone with all pertaining contact numbers should be located on boat or in medical kit and each member of the safety team should be well informed of its whereabouts and how to use.

4.4 Safety freedivers

All safety freedivers should be experienced freedivers. In any case, safety freedivers must be able to dive to 40m and realize a hang dive of 1min at 30m. These skills will be systematically evaluated during the safety team practice.

The safety team should be present at least a week before the competition to be able to exercise in all the procedure during the trainings.

4.4.1 Equipment

- Exposure protection via wetsuit in order to protect diver from sun and or cold. A wetsuit also provides positive buoyancy to assist the safety diver in below surface blackout occurrences.
- Ballast should only be used to compensate for positive buoyancy above 15 meters and the safety should not be negative shallower than 15 meters.
- A white or yellow lycra t-shirt to identify each safety as a member of the team and to allow for easy visibility at depth.
- Each safety diver should carry a small, streamlined cutting device and should be worn on the belt.
- Each safety should wear and carry an attached snorkel. In the event that the safety's head needs to be in the water the snorkel should be simply attainable and accessible to the safety's airway.
- Long blade fins are a requirement

- Safety diver should be using a depth gauge with timing device.

4.4.2 Safety freediver roles

Below are job descriptions for each member of the safety team

4.4.2.1 Safety 1 (Primary Diver)

- Verify depth verbally so judges and platform or line coordinator can clearly hear. This is done by visually verifying markings above and below set depth. This check should be done during both training and competition and additionally checked by a member of the judge team during competition.
- Verify that lanyard is on and secure by visually and physically testing the security of the lanyard. Make sure lanyard velcro is secure and that male and female velcro are mated properly. A verbal expression of this verification must be clearly heard and understood by judges and platform or line coordinator. A second verification should be completed by the judges during the competition or the secondary safety diver during training.
- Verify that official gauges are on and secure. A verbal expression of this verification must be clearly heard and understood by judges and platform or line coordinator.
- Meets the athlete at a depth of approximately 30meters. The signal of dive should be given by judges according to the announced time (1min before the end of the dive time) or video feed/sonar when the athlete is at 60m
- During dive, primary has only 20 seconds additional time from the time he or she reaches his or her position at depth and after that time he or she must wave off the dive if the athlete is not in sight or making progress up the line. The signal is a full arms extended waving overhead and should be horizontal in reference to the surface so that the signal can easily be seen at depth from the surface (FLY MODE). Additional safeties should be placed within sight of the surface as needed if visibility issues are present at dive sight.
- In the event of an underwater blackout, the primary has priority for rescue actions but if the secondary is closer and start rescue actions then he or she then becomes the primary safety diver and the Number 1 would take over the role of the Secondary (Number 2).
- After dive, Primary diver becomes secondary diver (Safety 2)
- Safety divers should verbally or non verbally report his or her positions before each dive to ensure all roles have been filled.

4.4.2.2 Safety 2 (Secondary Diver)

- Verify depth verbally so that judges and platform or line coordinator can clearly hear. This is done by visually verifying markings above and below set depth
- Verify that lanyard is on and secure. A verbal expression of this verification must be clearly heard and understood by judges and platform or line coordinator.
- Verify that official gauges are on and secure. A verbal expression of this verification must be clearly heard and understood by judges and platform or line coordinator.
- Meets the athlete at a depth of 20 meters. (dive when the athlete is at a depth of 45m or 50s before the end of the dive time)
- In the event of an underwater blackout, the primary has priority for rescue actions however, if the secondary is closer and start rescue actions then he or she

now becomes the primary safety diver and the Number 1 would take over the role of the secondary.

- In the event of an underwater blackout, the secondary will assist the primary by lifting athlete and Primary Safety simultaneously. Pulling the athlete only has the potential to force separation of the primary from the athlete and therefore opening airway of victim.
- Upon completion of judge presentation of card, secondary will release the lanyard, take of the gauges and deliver them to judges and escort athlete towards pre determined competition zone exit.
- Secondary diver becomes safety 4 for next athlete in line.
- Safety divers should verbally or non verbally report his or her positions before each dive to ensure all roles have been filled.

4.4.2.3 Safety 3 (Scooter safety)

Underwater scooters are a great tool for deep safety and must be used to provide safety.

The following is a guideline for using underwater scooter for competition safety.

- Leave the surface with 70 seconds remaining in the announced dive time or when the athlete is at a depth of 80m. This will put you at a depth of 40 meters when you rendezvous with the returning athlete.
- As pass through 30 meters begin the downshift so that you are in the lowest and slowest gear as you rendezvous with the athlete.
- Power downward until you reach the depth of the athlete then turn up and under and maintain speed of athlete on his or her ascent. This will allow for quick retrieval and continued downward direction in the event the athlete is struggling below the normal rendezvous depth. In other words you are not stopping and waiting on the athlete to reach so as not to take time to reestablish descent in the event of issues deeper.
- Maintain close distance (2-3 meters) at a 45 degree angle from front of athlete slightly below the level of watching for signs of loss of motor control or loss of airway control.
- If the athlete needs assistance at a depth below 30 meters, the scooter safety will grab the athlete under the arm and secure the airways above the water. The scooter safety will then be positioned in the back of the athlete. Finning during the ascent will increase the speed of ascent if necessary.
- Once athlete meets the 30 meter safety and the safety 1 establishes the 45 degree angle at eye level, at the right of the athlete, then the scooter diver will be positioned behind that safety and in the event of a blackout can give the safety assistance to the surface. Do not assist by dragging athlete. Instead, the scooters upward force should be applied to the safety diver controlling the airway of the athlete.
- Once the diver has passed through 10 meters the scooter safety should carefully drive away from the competition zone avoiding spectators.

The scooter safety should limit his or her dives to one dive every 12 minutes and no more than 20 per day to avoid DCS related issues.

4.4.2.4 Safety 4 (backup safety)

- Verify that the primary and secondary roles are filled and that they have completed their pre-dive surface roles.
- Always ready to dive in the event that Number 1 or Number 2 divers have an issue and are unable to dive (i.e.: Equalization issue)
- In the event of a blackout, dive down to ascending safety diver and assist with extraction of athlete. When assisting with underwater blackout it is important that only two safeties have direct contact with athlete. Additional lift should be directed towards the primary safety diver. On any and all blackouts the primary safety diver is considered the diver in control of the airway.
- Safety divers should verbally or non verbally report his or her positions before each dive to ensure all roles have been filled.
- Backup safety becomes primary diver (safety N1) for next athlete in line.

4.4.3 In water positioning of safeties

- Before official top, safety should be clear of the possible contact of athlete as well as between the visual line of judges and athlete.
- Safeties should be aware of his or her position in the water column at all times.
- Safeties should maintain eye contact with athlete at all times at the same level as the athlete's eyes. This is the priority.
- Primary and secondary should be positioned at a 45 degree angle from the front of the athlete on opposite sides. Secondary should be aware of the primary's initial positioning and fill in the side opposite the athlete.
- Both safeties should try and surface at both sides of the athlete and not between the judges on the platform, while at the same time keeping the line of sight between the judges and the athlete clear.
- Upon surfacing the safeties should back out of the area maintaining a 2 meter distance from athlete. Once the athlete reaches the surface it is only the judgement of the judge to grab the athlete.

4.4.4 Steps to blackout or LMC recovery

A blackout can be very intimidating for a safety diver and many times an overreaction will occur. The following steps should be taken to quickly promote the breathing response in the athlete.

1. Secure the airway above the water
2. Remove all facial gear from athlete's face
3. Calmly blow to the nose, tap and talk to athlete giving ample time to assess the condition of athlete. Three blow tap and talks should take less than 10 seconds and is sufficient in the assessment period. A tap is defined as a gentle tapping of the cheek only using the tips of the fingers. An aggressive, heavy slapping can prolong the blackout.
4. Assessment is visual and/or audible. If the athlete's eyes are open wide then he or she is in a blackout state and once the eyes close then conscience has been regained.
5. If breathing is not apparent after blow, tap, talk then two « mouth to nose » rescue breaths while obstructing mouth airway should be administered to athlete. The first breath opens the possible laryngospasum and the second delivers air to the lungs.

6. If breathing is still not apparent then a breath with nose held every 5 seconds should commence and an immediate evacuation to boat or platform and doctor should begin.
7. Oxygen should be administered immediately with positive pressure.

4.4.5 Blackout Protocol

The number one rule in a blackout or LMC (Loss of Motor Control) is to protect the athlete's airway from contact with the water. This will prevent water inhalation which will complicate resuscitation.

The following is a list of procedures to manage the three forms of blackout:

4.4.5.1 Surface Blackout

- Secure the athlete's airway by providing lift under his or her armpit. If the victim falls forward the opposite hand should be under chin at water level and the "head sandwich" which is a maneuver by the Primary Safety in which one hand covers and protects both the oral and nasal airways while at the same time the safety's other hand is placed at the base of the head and neck to create a "sandwich" of the head. This should be employed to place victim on his or her back.
- Removal of the facial gear is done by the safety 1, once the judges call the "Grab" This should be the first step in recovery.
- A calm, slow blow tap and talk is mandatory for blackout recovery and provides the safety team proper assessment of the severity of the blackout
- Remaining safeties are providing lift to both the victim and the primary safety diver and the victim should be flattened along surface. This maintains airway above the water and allows for easy access to the airway for further resuscitation needs. A flat position also reduces water pressure on chest for easier inflation of lungs.
- All blackout recover should be conducted as close to the competition line as possible and the line should be used as a means of securing the vertical and horizontal positioning of the athlete.
- Removal of the lanyard should be completed by the safety N2
- Shading of the athlete's eyes should be done by a member of the team not providing direct care to athlete.

4.4.5.2 Subsurface blackout

- Secure the airway using the "Head Sandwich" which is a maneuver by the Primary Safety in which one hand covers and protects both the oral and nasal airways while at the same time the safety's other hand is placed at the base of the head and neck to create a "sandwich" of the head. This prevents water from entering the airways and provides a streamline means of transporting athlete to the surface.
- Secondary safety provides lift to both the athlete and the Primary safety.
- Upon arrival at surface, the actions described at 4.4.5.1 are followed.

4.4.5.3 Pre-dive packing blackout or vasovagal syncope

Although not a common occurrence, knowledge of the packing blackout should be known by the safety team so that they are aware of its possibilities. The packing blackout occurs when the athlete's lung volume displaces the normal rhythm of the heart and therefore causes a short term blackout. This condition is very short in duration and requires attention from the safety team at the beginning of the performance.

4.4.6 Media safety

Scuba diving by the media team should be approved by the Chief of Safety and should be conducted using a strict “Buddy” system. Scuba diving in deep open ocean can be a challenge to less experienced divers and can quickly become dangerous when focus is placed on the deep diving apneist.

The buddy system will also be used in the case of photographers freediving to get images.

4.4.7 Spectator security

Spectators are becoming a larger part of the competition scene and if the sport is to grow, so will the spectators surrounding it. Safety guidelines should be established for these onlookers otherwise accidents are bound to happen. The following is a list of suggested rules for spectators:

- No Freediving for spectators
- No Scuba diving during competition except for the media team.