

Syllabus Number: 3.A.7

CMAS Three Stars Diver Training Programme

Minimum Training Programme Content

1. Required theoretical knowledge

1.1 **Subject Area 1: Introduction**

1.1.1 The participant shall be provided with all such information, as provided for in Clause 4.2 of Chapter 1 in order to enable him to take an informed decision about his participation in the CMAS Three Star Diver Training Programme.

1.1.2 The participant shall be provided with the information about the CMAS as provided for in Clause 4.3 of Chapter 1.

1.2 **Subject Area 2: Advanced Diving Knowledge**

1.2.1 The participant shall have mastered a professional level of knowledge of diving theory equal to that of a CMAS Instructor with regard to the following topics:

1.2.1.1 **Topic 1: Diving Equipment**

1.2.1.1.1 The participant shall have a sufficient understanding and knowledge of the purpose, working principles, selection, preparation, use and care of Scuba and Emergency equipment:

1.2.1.2 **Topic 2: The physics of diving**

1.2.1.2.1 The participant shall have a sufficient understanding and knowledge of diving physics with regard to the following topics:

1.2.1.2.2 ***The physical world***

1.2.1.2.2.1 Matter

1.2.1.2.2.2 The three states of matter

1.2.1.2.3 ***Gasses in diving***

1.2.1.2.3.1 Oxygen

1.2.1.2.3.2 Nitrogen

1.2.1.2.3.3 Carbon dioxide

1.2.1.2.3.4 Carbon monoxide

1.2.1.2.3.5 Water vapour

1.2.1.2.4 ***Units of measurement***

1.2.1.2.5 ***Humidity***

1.2.1.2.6 ***Energy***

1.2.1.2.6.1 Light

1.2.1.2.6.2 Sound

1.2.1.2.6.3 Heat

1.2.1.2.7 **Pressure**

- 1.2.1.2.7.1 Atmospheric pressure
- 1.2.1.2.7.2 Hydrostatic pressure
- 1.2.1.2.7.3 Gauge pressure
- 1.2.1.2.7.4 Absolute pressure
- 1.2.1.2.7.5 Partial pressure (Dalton's Law)

1.2.1.2.8 **Density**

- 1.2.1.2.8.1 Atmospheric density
- 1.2.1.2.8.2 Hydrostatic density
- 1.2.1.2.8.3 Buoyancy (Archimedes' Principle)

1.2.1.2.9 **Gas flow (viscosity)**

1.2.1.2.10 **Drag, propulsion and trim**

1.2.1.2.11 **Kinetic theory of gasses**

- 1.2.1.2.11.1 Boyle's Law
- 1.2.1.2.11.2 Charles' Law
- 1.2.1.2.11.3 The General Gas Law
- 1.2.1.2.11.4 Buoyancy (Archimedes' Principle)

1.2.1.2.12 **Gas diffusion**

- 1.2.1.2.12.1 Gasses in liquids

1.2.1.3 Charles' Law

1.2.1.4 **Topic 3: Medical and psychological issues related to diving**

- 1.2.1.4.1 The participant shall have a sufficient understanding and knowledge of the human anatomy and physiology as well as the causes, signs and symptoms as well as the first aid treatment of the diving ailments listed below:

1.2.1.4.1.1 **Anatomy and physiology**

1.2.1.4.1.1.1 The respiratory system

- 1.2.1.4.1.1.1.1 Mechanism of breathing
- 1.2.1.4.1.1.1.2 Gas exchange
- 1.2.1.4.1.1.1.3 Control of respiration
- 1.2.1.4.1.1.1.4 Blood

1.2.1.4.1.1.2 The circulatory system

- 1.2.1.4.1.1.2.1 The heart
- 1.2.1.4.1.1.2.2 Blood vessels
- 1.2.1.4.1.1.2.3 Circulatory failure

1.2.1.4.1.1.3 Immersion effects on respiration and circulation

1.2.1.4.1.2 **Barotrauma**

- 1.2.1.4.1.2.1 Dental barotrauma
- 1.2.1.4.1.2.2 Ear barotraumas (middle, external and inner ear)
- 1.2.1.4.1.2.3 Facial barotrauma
- 1.2.1.4.1.2.4 Sinus barotraumas
- 1.2.1.4.1.2.5 Pulmonary barotraumas including emphysema, pneumothorax arterial gas embolism
- 1.2.1.4.1.2.6 Gastrointestinal barotrauma

1.2.1.4.1.3 ***Toxic gas effects***

- 1.2.1.4.1.3.1 Nitrogen narcosis
- 1.2.1.4.1.3.2 Carbon dioxide toxicity
- 1.2.1.4.1.3.3 Carbon monoxide toxicity
- 1.2.1.4.1.3.4 Oxygen toxicity

1.2.1.4.1.4 ***Decompression illness***

1.2.1.4.1.5 ***Temperature***

- 1.2.1.4.1.5.1 Hypothermia
- 1.2.1.4.1.5.2 Hyperthermia

1.2.1.4.1.6 ***Other conditions***

- 1.2.1.4.1.6.1 Alternobaric vertigo
- 1.2.1.4.1.6.2 Carotid sinus syndrome
- 1.2.1.4.1.6.3 Near drowning
- 1.2.1.4.1.6.4 Saltwater aspiration syndrome

1.2.1.4.1.7 ***Psychological problems***

- 1.2.1.4.1.7.1 Mental stress
- 1.2.1.4.1.7.2 Panic
- 1.2.1.4.1.7.3 Overconfidence

1.2.1.5 **Topic 4: The use of diving tables and dive computers**

- 1.2.1.5.1 The participant shall have an appropriate knowledge concerning the use of dive tables including:
 - 1.2.1.5.1.1 Original and current decompression theory
 - 1.2.1.5.1.2 Nitrogen absorption and elimination
 - 1.2.1.5.1.3 Theory of bubble formation and bubble detection
 - 1.2.1.5.1.4 How to determine dive profiles which include Stage-stop decompression diving for single and repetitive dives.
 - 1.2.1.5.1.5 How to enact the required Stage-stop decompression.
 - 1.2.1.5.1.6 How to use dive tables to properly plan and execute a dive.
 - 1.2.1.5.1.7 Flying after diving.
 - 1.2.1.5.1.8 Computer assisted diving
 - 1.2.1.5.1.9 Factors that increases the chances of decompression sickness
 - 1.2.1.5.1.10 How to prevent decompression sickness
 - 1.2.1.5.1.11 Omitted decompression

1.2.1.6 Topic 5: Dive planning

1.2.1.6.1 The participant shall have appropriate knowledge concerning the following dive planning issues:

1.2.1.6.1.1 The factors that affect dive planning

1.2.1.6.1.2 The dive planning process including the determination of the required gas

1.2.1.6.1.2.1 Advance planning and preparation

1.2.1.6.1.2.2 Short-term planning and preparation

1.2.1.6.1.2.3 On site-planning and preparation

1.2.1.6.1.3 Contingency planning

1.2.1.6.1.4 Emergency planning

1.2.1.6.1.5 Communications, both under-water and on the surface.

1.2.1.6.1.6 Recommended safe diving practices

1.2.1.6.1.7 Limitations of diving with no direct access to the surface

1.2.1.7 Topic 6: Diver rescue procedures

1.2.1.7.1 The participant shall have an appropriate knowledge concerning the following diver rescue procedures:

1.2.1.7.1.1 Accident prevention

1.2.1.7.1.2 Rescuer safety

1.2.1.7.1.3 Diver assistance techniques

1.2.1.7.1.4 Buddy rescue techniques including lifting, towing and landing a diving casualty

1.2.1.7.1.5 Lost diver procedures

1.2.1.7.1.6 Search techniques that can be used in an emergency

1.2.1.7.1.7 Rescue breathing and Cardio Pulmonary Resuscitation

1.2.1.7.1.8 Oxygen first-aid

1.2.1.7.1.9 Emergency procedures and summoning emergency services

1.2.1.8 Topic 7: Underwater navigation

1.2.1.8.1 The participant shall have appropriate knowledge concerning underwater navigation including the following topics:

1.2.1.8.1.1 Navigational equipment for divers

1.2.1.8.1.2 The diving compass

1.2.1.8.1.3 Natural navigation

1.2.1.8.1.4 Compass navigation

1.2.1.8.1.5 Combining navigational techniques

1.2.1.9 Topic 8: The diving environment

1.2.1.9.1 The participant shall have appropriate knowledge concerning the following environmental issues:

1.2.1.9.1.1 Introduction to marine biology covering “drifters” (i.e. plankton), “swimmers” (i.e. fish) and “bottom dwellers (i.e. sea fans, hydroids etc.)

1.2.1.9.1.2 Hazardous marine animals

1.2.1.9.1.3 Pollution

1.2.1.9.1.4 Diver impact on the diving environment and ways to minimise diver impact

1.2.1.9.1.5 Conservation and preservation of the diving environment

1.2.1.9.1.6 Diving conditions

- 1.2.1.9.1.7 Specific fresh water diving conditions
- 1.2.1.9.1.8 Specific sea water diving conditions
- 1.2.1.9.2 Tides, waves and surf, and currents
- 1.2.1.9.3 Orientation to new diving environments

1.3 **Subject Area 3: Dive Leadership knowledge**

1.3.1 The participant shall have a professional level of knowledge and understanding of the following dive leadership topics that will allow him to plan, execute and lead other divers on open water dives in all typical conditions encountered in the local environment, to plan for and respond to possible emergencies during such dives and to serve as an instructional assistant to a CMAS Instructor during diver training programmes:

1.3.2 **Topic 1: The role of the CMAS Dive Leader**

- 1.3.2.1 Underwater guide
- 1.3.2.2 Underwater supervisor
- 1.3.2.3 Out-of-water supervisor
- 1.3.2.4 Instructional Assistant
- 1.3.2.5 First responder to emergencies
- 1.3.2.6 Counsellor to help divers deal with stress
- 1.3.2.7 Seaman to assist skipper with boat
- 1.3.2.8 Oceanographer to answer questions of divers about underwater environment
- 1.3.2.9 Customer relations management expert to ensure divers an enjoyable experience

1.3.3 **Topic 2: Diving related legislation and requirements**

- 1.3.3.1 Negligence and liability issues
- 1.3.3.2 Competencies of CMAS One and Two Star Divers
- 1.3.3.3 Other legislation applicable to the country where the training programme is presented

1.3.4 **Topic 3: Dive planning duties and responsibilities**

- 1.3.4.1 Familiarization with divers and dive site
- 1.3.4.2 How to perform a risk assessment
- 1.3.4.3 How to prepare an emergency plan
- 1.3.4.4 Information to be conveyed to divers before any guided or organised dive

1.3.5 **Topic 4: Dive management and control**

- 1.3.5.1 What is dive management and control?
- 1.3.5.2 Equipment to assist dive management and control
- 1.3.5.3 Information to be conveyed to divers before any guided or organised dive
- 1.3.5.4 The pre-dive briefing
 - 1.3.5.4.1 Dive supervision procedures and techniques
 - 1.3.5.4.2 The dive de-briefing
 - 1.3.5.4.3 Environmental orientation dives
 - 1.3.5.4.4 Boat diving supervision and control
 - 1.3.5.4.5 Deep diving supervision and control
 - 1.3.5.4.6 Night diving supervision and control
 - 1.3.5.4.7 Drift diving supervision and control
 - 1.3.5.4.8 Shore diving supervision and control
 - 1.3.5.4.9 Cold water diving supervision and control
 - 1.3.5.4.10 Limited visibility diving supervision and control

1.3.6 **Topic 5: Rescue management**

- 1.3.6.1 What is rescue management?
- 1.3.6.2 Priorities in a rescue
- 1.3.6.3 Acting as a Rescue manager in an emergency

1.3.7 **Topic 6: Working with a CMAS Instructor as an Instructional Assistant**

- 1.3.7.1 The role, duties and responsibilities of the Instructional Assistant
- 1.3.7.2 Professionalism and attitude when working with students
- 1.3.7.3 Information to be provided to students before confined and open water training
- 1.3.7.4 Requirements when providing equipment to students
- 1.3.7.5 CMAS One Star Diver skills
- 1.3.7.6 The demonstration technique
- 1.3.7.7 Commonly encountered problems during in-water training

1.4 **Subject Area 4: Career development**

- 1.4.1 The participant shall be provided with the career development information as provided for in Clause 4.4 of Chapter 1.

2. Required SCUBA skills

No confined water assessment

2.1 **Open water skills**

- 2.1.1 All skills mastered during Diver One Star and Diver Two Star courses need to be perfected and may be examined during the assessment dives
- 2.1.2 Surface marker buoy skills

- 2.1.2.1 The participant shall be able to competently demonstrate his mastery in the use of a surface marker buoy (delayed and permanent).

2.1.3 **Deep diving skills**

- 2.1.3.1 The participant shall demonstrate mastery of the techniques involved in planning and executing dives beyond the depth ranges typical for recreational SCUBA diving in the local environment. Specifically these techniques shall address the following issues:

- 2.1.3.1.1 Nitrogen narcosis
- 2.1.3.1.2 Air consumption and breathing
- 2.1.3.1.3 Decompression limits
- 2.1.3.1.4 Proper ascent procedures including in-water stops
- 2.1.3.1.5 Buoyancy changes
- 2.1.3.1.6 Use of specific equipment (e.g. emergency breathing gas supply)
- 2.1.3.1.7 Emergency equipment and procedures

2.1.4 **Underwater navigation skills**

- 2.1.4.1 The participant shall demonstrate his mastery of underwater navigation.
- 2.1.4.2 The participant shall demonstrate his ability to plan, organise and conduct his dives and to safely lead other recreational scuba divers using both instrument and natural navigation techniques.

2.1.5 **Rescue skills**

2.1.5.1 The participant shall demonstrate diver rescue skills by completing at least one open water rescue. The rescue exercise shall include in the following:

- 2.1.5.1.1 Recognition of emergency situations (e.g. loss of breathing gas supply, lack of response)
- 2.1.5.1.2 Basic underwater search techniques
- 2.1.5.1.3 Controlled casualty recovery from depth
- 2.1.5.1.4 Effective emergency surface actions
- 2.1.5.1.5 Casualty recovery from the water
- 2.1.5.1.6 Emergency situation management including co-ordination with emergency services
- 2.1.5.1.7 First-Aid treatment and Cardiopulmonary Resuscitation (CPR)
- 2.1.5.1.8 Oxygen Administration

2.1.6 Dive leadership skills

2.1.6.1 The participant shall be able to competently demonstrate the following dive leadership skills in depth ranges and environmental conditions typical to those usually encountered by the CMAS Three Star Diver:

2.1.6.1.1 Dive planning and preparation that will include the following:

- 2.1.6.1.1.1 Site selection taking into account dive team capabilities and environmental factors
- 2.1.6.1.1.2 Risk assessment, emergency plan and equipment preparation
- 2.1.6.1.1.3 Decompression calculation and consideration of other factors affecting off-gassing e.g. flying and other changes in altitude, physical activities
- 2.1.6.1.1.4 Dive limits
- 2.1.6.1.1.5 Descent and ascent aids (e.g. shot line, emergency breathing gas supply)
- 2.1.6.1.1.6 Indicating diving operations where required (e.g. by means of A-flag or other signals)

2.1.6.1.2 Dive briefing that will include the following:

- 2.1.6.1.2.1 Team assignments
- 2.1.6.1.2.2 Time/depth limits
- 2.1.6.1.2.3 Problem/emergency procedures
- 2.1.6.1.2.4 Site/environmental considerations
- 2.1.6.1.2.5 Communications
- 2.1.6.1.2.6 Pre-dive equipment preparation

2.1.6.1.3 Dive conduct that will include the following:

- 2.1.6.1.3.1 Kitting up and pre-dive checks
- 2.1.6.1.3.2 Entry control
- 2.1.6.1.3.3 Descent control
- 2.1.6.1.3.4 Monitoring of time, progress with dive plan, and SCUBA divers' breathing gas supplies
- 2.1.6.1.3.5 Awareness of stress levels of SCUBA divers
- 2.1.6.1.3.6 Identification of under water hazards
- 2.1.6.1.3.7 Appropriate reaction to problems and emergencies
- 2.1.6.1.3.8 Underwater navigation
- 2.1.6.1.3.9 Safe ascent and exit control

2.1.6.1.4 Post-dive procedures that will include the following:

- 2.1.6.1.4.1 Check out procedures
- 2.1.6.1.4.2 Debriefing
- 2.1.6.1.4.3 Check decompression calculation and consideration of other factors affecting off-gassing (e.g. flying and other changes in altitude, physical activities)
- 2.1.6.1.4.4 Equipment care and post dive maintenance
- 2.1.6.1.4.5 Recording the dive