



Maldives Civil Aviation Authority
Republic of Maldives

Maldivian Civil Aviation Regulations

MCAR 138B - Water Aerodrome Standards

Issue 1.00, 31 May 2023

Foreword

Maldives Civil Aviation Authority, in exercise of the powers conferred on it under Articles 5 and 6 of the Maldives Civil Aviation Authority Act 2/2012 has developed this Regulation.

This Regulation shall be cited as ‘MCAR 138-B Water Aerodrome Standards’ and shall come in to force on 31st May 2023.

For the Civil Aviation Authority

Hussain Jaleel

Chief Executive

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Chapter 1 — General

1.1 General

This regulation prescribes the standards for the physical characteristics, obstacle limitation surfaces (OLS), visual aids, services and operating procedures to be provided at a water aerodrome certified under MCAR 138A – Water Aerodrome Rules.

A water aerodrome operator shall comply with the standards contained in this regulation as appropriate to the operations conducted at the aerodrome and the requirements for aircraft using the aerodrome.

1.2 Definitions

Definitions of the terms and abbreviations used in this regulation, unless the context requires otherwise, are in MCAR-1 Definitions and MCAR-138A Water Aerodrome Rules.

Gangway means a movable walkway where people board and disembark such as platforms and piers.

Low water level means the average low level during that month of the year when levels are lowest or, in the case of tidal waters, the average level of low water springs or lower low waters, depending on the type of tide.

Mooring means a fixed permanent installation on the water surface used to secure seaplanes. The seaplane may be moored to a floating buoy, a pier, platforms, etc.

Mooring buoy means a buoy connected by chain or cable to a permanent unmovable anchor sunk deeply into the bottom of a body of water.

Protected area means an area which is protected from large waves. The structure providing protection can be natural or constructed.

Taxi channel means a defined path on a water aerodrome, intended for the use of taxiing seaplanes.

Turning basin means a water area used for the seaplane maneuvering of seaplanes along shoreline facilities and at the ends of a narrow water runway.

Waterways means a river, canal or other waterbody serving as a route or way of travel or transport.

Water aerodrome means a defined area, primarily on water, intended to be used either wholly or in part for the arrival, departure and movement of seaplanes, and any building and equipment on ground or water.

Water aerodrome operator means any organization/ or person in charge of a water aerodrome including employee, agent or other authorized representative.

Water current means its rate of flow of the water.

Chapter 2 — Water Aerodrome Data

Note. — This Part contains specifications for the provision of data relating to the water aerodrome that is to be determined and recorded in the Water Aerodrome Manual (WAM). This Part is also used to define the characteristics of water aerodrome that are to be made available through the aeronautical information publications and/or disseminated through an aeronautical information service.

2.1 Water Aerodrome data quality requirements

2.1.1 Except as specified, the determination and reporting of water aerodrome-related aeronautical data shall be in accordance with the accuracy requirements set forth below considering the established quality system procedures:

- a) The water aerodrome elevation shall be measured to the accuracy and rounded up to the next higher of one-half metre or foot;
- b) Linear dimensions shall be measured to the nearest one-half metre;
- c) Aeronautical geographical co-ordinates (indicating latitude and longitude) shall be expressed in terms of the WGS-84 reference datum;
- d) True bearings shall be measured to the nearest degree;
- e) Water depths shall be measured and rounded down to the nearest one tenth of metre; and
- f) Tides shall be measured with respect to lowest tides recorded for the location.

2.2 Geographic data

Geometric centre

2.2.1 The geometric centre of a water aerodrome shall be determined and given to the nearest 1/10th second.

Water aerodrome magnetic variation

2.2.2 The magnetic variation for the water aerodrome geometric centre shall be determined and given to the nearest degree from magnetic north.

Navigation aids

2.2.3 Where navigation aids are installed for use at water aerodromes, the following information shall be determined and given:

- a) the bearing, geographic co-ordinates of the antenna or radiating centre to the nearest 1/10th second; and
- b) the elevation of the antenna or radiating centre.

2.3 Water aerodrome dimensions and related information

2.3.1 The following data shall be measured or described and given for each facility provided on a water aerodrome:

- a) water runway(s):
 - (i) true bearing;
 - (ii) length;
 - (iii) width;
 - (iv) depth of water; and
 - (v) water current
- b) turning basins:
 - (i) location;
 - (ii) dimension; and
 - (iii) depth of water
- c) taxi channel:
 - (i) width; and
 - (ii) depth of water
- d) shore facility:
 - (i) type;
 - (ii) dimensions
 - (iii) water depth
- e) docks/platform:
 - (iv) type;
 - (v) dimensions
 - (vi) water depth
- f) significant obstacles on and in the vicinity of the water aerodrome:
 - (i) location;
 - (ii) top elevation to the nearest (next higher) foot; and
 - (iii) type
- g) marking
 - (i) water runways;
 - (ii) taxi channels; and
 - (iii) hazardous areas

2.4 Provision of operational information

Movement area and related facilities

- 2.4.1 Information on the condition of the movement area and the operational status of related facilities shall be given to the aeronautical information service;
- 2.4.2 Information of operational significance shall be given to the air traffic services; and
- 2.4.3 The information shall be kept up to date.
- 2.4.4 The condition of the movement area and the operational status of related facilities shall be monitored and reports of operational significance or affecting seaplane performance shall be given to the appropriate air traffic services units in respect of:
 - a) damage to water aerodrome facility;
 - b) floating debris in the movement area;

- c) temporary hazards to include log booms, surface vessels or any other surface or below surface hazard;
- d) abnormally high/low water depth;
- e) water currents;
- f) tidal areas, depth of water at high and low tides or seasonal changes; and
- g) any other information that may have safety impact on operations.
- h) Information on water runway(s) shall consist of:
 - i) the tidal range;
 - j) the times of high and low tide; and
 - k) the approximate speed and direction of the water current.

Chapter 3 — Physical Characteristics

3.1 Water runway

3.1.1 Number and orientation of water runways

The number of water runways at a water aerodrome and their orientation shall be such that, for a large percentage of time as practicable but for not less than 95 percent there is at least one water runway for which the surface wind velocity component at right angles to its longitudinal axis will not preclude the landing or taking off of seaplane that the water aerodrome is intended to serve.

3.1.2 Length of water runways

The length of the water runway to be provided shall be adequate to meet the operational requirements of the critical seaplane for which the runway is intended and shall be not less than the longest length determined by applying the corrections for local conditions to the operations and performance characteristics of the relevant seaplanes.

3.1.3 Width of water runways

The width of the water runway shall be not less than 60 m.

3.1.4 Water Depth

The depth of the water measured at low water level in the water runway shall not be less than 1.8 m (6 ft.) or less than 0.3 m below the hull or floats when the seaplane is stationary and loaded to maximum take-off weight.

3.1.5 Water runway strip

A protective buffer shall extend on each side from the edge of the water runway to a distance of not less than 30 m (100 ft.) and on each end of the water runway to a distance of 60 m.

3.2 Turning basins

- 3.2.1 Turning basins shall be provided at the end of the water runway, whenever necessary.
- 3.2.2 When turning basins are provided it shall have:
- a) A diameter measured at low water level of not less than twice the specified minimum width of the corresponding water runway;
 - b) A depth at least that of the corresponding water runway measured at low water level; and
 - c) A horizontal obstruction clearance between the edge of the turning basin and the nearest obstacle of no less than 15 m (50 ft.)

3.3 Taxi channels

- 3.3.1 Taxi channels shall be provided to permit the safe and expeditious handling of aerodrome traffic. Where provided, the taxi channels shall have a width of not less than 45 m (150 ft.)
- 3.3.2 Wingtip to wingtip clearance for passing seaplanes (dual directional taxi channels) shall be not less than 15 m (50 ft.).
- 3.3.3 The depth of the water measured at low water level in the taxi channel shall not be less than 1.8 m (6 ft.) or less than 0.3 m below the hull or floats when the seaplane is stationary and loaded to maximum take-off weight.

3.4 Mooring areas

- 3.4.1 Mooring areas shall be provided, whenever necessary, for the mooring of seaplane and to permit the embarkation and disembarkation of passengers, loading and unloading of cargo and mail without interfering with the aerodrome traffic.
- 3.4.2 When mooring areas are provided:
- a) The size of the mooring areas shall be adequate to permit expeditious handling of the peak hour traffic.
 - b) The depth of water at the mooring area measured at low water level shall be at least that of the corresponding taxi channel.
 - c) The mooring area shall be designed in such a manner as to provide a minimum clearance of 15 m (50 ft.) between any part of the seaplane and any object it could come into contact with depending on water level.

3.5 Shore facilities

- 3.5.1 A platform (fixed or floating), ramp or beach shall be provided to permit the embarking and disembarking of passengers and crew, loading and unloading of cargo and refuelling.
- 3.5.2 Where a platform is provided it shall:
- a) be designed and maintained in such a way that permits constant use without causing injury to persons or damage to aircraft;

- b) be attached or anchored in a manner that prevents it from shifting position or becoming detached;
- c) have access from the shore that provides for the safe movement of crew and passengers; and
- d) have at least two bull rails or provision for appropriate number of tie-down cleats at each seaplane parking position to secure the seaplane.

3.5.3 When a seaplane is normally secured in a position where any seaplane component overhangs the platform and constitutes a hazard to the movement of crew and passengers, the hazard shall be clearly indicated:

- a) by means of cones; and/ or
- b) by means of hashed red and white markings; and
- c) in a manner easily identifiable to crew and passengers.

3.5.4 Where a ramp or beach is provided it shall be:

- a) built 1.5 times the width of floats or landing gear of the largest seaplane intended to use the facility;
- b) located in such a manner as to provide a minimum clearance of 1.8 m (6 ft.) between a seaplane wing and any object it could come into contact with; and
- c) constructed with a slope not steeper than 8:1.

Chapter 4 — Obstacle Restriction and Removal

Note:— This Part establishes a series of Obstacle Limitation Surfaces (OLS) that define the limits to which objects may project into the airspace in order to minimize the dangers presented by obstacles, either during take-off or approach of seaplanes at water aerodromes.

4.1 Obstacle limitation surfaces

4.1.1 The following OLS shall be established for non-instrument water aerodromes as shown in Figure 1 provided in Appendix 1:

- a) a take-off climb/approach surface;
- b) a transitional surface; and
- c) an inner horizontal surface.

Take-off climb /approach Surface

4.1.2 Description – The take-off climb/approach surface shall be either straight or curved and established at the end/beginning of the water runway strip.

4.1.3 Characteristics – The limit of the take-off climb /approach surface:

- a) The width of the inner edge shall not be less than that of the associated water runway strip;
- b) The inner edge shall start at 60 m from threshold of water runway;
- c) The elevation of the inner edge shall be the elevation of the water aerodrome;
- d) The length of the take-off climb /approach surface shall not be less than 2500 m (8200 ft.) from the inner edge;
- e) The slope of the take-off climb/approach surface shall be a minimum of 4 % (1:25);
- f) The centre line of the take-off climb/approach surface shall define the approach path and be:
 - (i) a straight line; or
 - (ii) an arc of constant radius; or
 - (iii) a combination of a straight line and an arc of constant radius.

Curved take-off climb/approach Surfaces

4.1.4 Where established, a curved take-off climb/approach surface shall not contain more than one curved portion.

4.1.5 A curved portion of a take-off climb/approach surface shall not allow a change of direction greater than 90 degrees.

4.1.6 Where a curved portion of take-off climb/approach surface is provided:

- a) the straight portion originating at the inner edge shall not be less than 1300 m (4265 ft.); and

- b) the radius of arc defining the centre line of the take-off climb/approach surface shall not in any portion of the take-off climb/approach surface be less than 736 m (2415 ft.) in accordance with Figure 2 given in Appendix 1.

4.1.7 A take-off climb/approach surface incorporating a curved portion shall be established only where guidance, such as, geographical points or other visual references are available.

Note:— A curved approach is normally established at a non-instrument water runway where it is necessary to avoid obstacles, terrain, noise sensitive areas, or to utilise the airspace above public lands (e.g. freeways, rivers, golf courses).

Table 1 - Dimensions and slopes of obstacle limitation surfaces - water aerodromes

Approach type – non-instrument	
Take-off climb/approach surface	
Width of inner edge	Width of water runway strip - (120 m minimum)
Location of inner edge	60 m from the threshold
Divergence take-off climb/approach surface	10 %
Length (minimum)	2500 m
Slope of take-off climb/approach surface (maximum)	4% (1:25)
Transitional Surface:	
Slope (maximum)	Vertical to 15 m then 1:5 (20 %)
Inner Horizontal Surface:	
Height	45 m
Radius	2,500 m

4.2 Displaced threshold

- 4.2.1 Where the integrity of the approach surface cannot be maintained due to fixed or mobile obstacles, a landing threshold shall be displaced from the normal threshold.
- 4.2.2 This displacement shall be established so that the new approach surface, starting at the displacement, will clear all obstacles.
- 4.2.3 Where a threshold has been displaced, the inner edge of approach surface shall be located at 60 m from the point of displacement.

4.3 Objects and obstacles

- 4.3.1 No fixed object shall be permitted on a water runway or on a water runway strip.
- 4.3.2 Fixed objects or structures that are located within the water aerodrome boundary shall not penetrate OLS unless:

- a) those structures are for air navigation purposes; or
- b) are essential to the safety of aircraft operation;
- c) are marked, in accordance with ASC 139-5; and
- d) are frangible.

4.3.1 A mobile object shall not penetrate take-off climb/approach surfaces, unless procedures are in place to ensure the object is removed during approach and departure operations.

4.4 Other objects

4.4.1 Where an aeronautical study (safety risk assessment) indicates that an object is hazardous to seaplane located on the movement area or in the air in the immediate vicinity of the water aerodrome, it shall be:

- a) removed; or
- b) marked; and/or
- c) lighted in accordance with ASC- 139-5, Chapter 6.

4.4.2 The water aerodrome operator shall conduct a safety risk assessment to establish the required clearances to be used above waterways, lagoons, or harbours.

Chapter 5 — Visual Aids for Navigation

5.1 Wind direction indicator

- 5.1.1 Unless the direction of the wind can be obtained by radio or by other means, at least one wind direction indicator shall be installed.
- 5.1.2 Where a wind direction indicator is installed, it shall be:
- a) of an international orange, orange and white or red and white colour; and
 - b) in the form of a truncated cone.
- 5.1.3 The wind direction indicator shall be:
- a) visible at a height of 300 m (1000 ft.) above the water runway; and
 - b) visible from any portion of the manoeuvring area.

5.2 Markings

5.2.1 Dock identification marking

Characteristics

- 5.2.1.1 Dock identification markings shall consist of:
- a) Platform numbers;
- 5.2.1.2 Both markings shall be affixed to the upper surface of the dock so as to be visible from 300 m (1000 ft.) above the water runway.

5.2.2 Marker buoys

Characteristics

- 5.2.2.1 Marker buoys shall be visible to aircraft:
- a) manoeuvring on the surface of water; and
 - b) 300 m (1000 ft.) above the water runway.

5.2.3 Water runway markers

- 5.2.3.1 Water aerodromes shall be marked as specified below:
- a) Both ends of the take-off and landing area shall be marked with floating markers.
 - b) The markers shall be visible from a distance greater than 2 nautical miles.
 - c) Each marker shall be:
 - of international orange in color; or
 - alternating international orange and white.

5.2.4 Displaced threshold markers

5.2.4.1 Where a threshold is displaced permanently or temporarily:

- a) the threshold displacement shall be marked with floating markers;
- b) the markers shall be visible from a distance of at least 2 nautical miles; and
- c) each marker shall be international orange or the markers shall be alternating international orange and white.

5.2.5 Hazardous areas markers

5.2.5.1 Where shoals or other hazards could endanger a seaplane, marker buoys shall be installed to clearly indicate the hazardous area.

5.2.5.2 Marker buoys for delineating hazardous area shall be distinctly marked from water runway markers in colour and shapes.

5.3 Signs

5.3.1 Prohibition signs

5.3.1.1 A sign shall be provided and displayed on the dock restricting the dock to seaplane operations only.

5.3.1.2 A sign shall be displayed on the dock restricting passengers from the docking area until all seaplanes and propellers have come to a complete stop.

5.3.2 Strobe Lights

5.3.2.1 Strobe lights shall be installed to delineate water aerodrome facilities wherever necessary. Where installed, the strobe lights shall be:

- a) white, quick flashing; and
- b) located in an area that is easily and constantly seen by both marine and air traffic.

Chapter 6 — Visual Aids for Denoting Obstacles

6.1 Objects to be marked and/or lighted

Fixed objects

- 6.1.1 Objects that are conspicuous by their shape, size or colour need not be marked.
- 6.1.2 Except as covered under the Marine Act, objects shall be marked in accordance with 6.2.

6.2 Marking of objects

General

- 6.2.1 Except as specified in 6.1.1 all fixed objects shall be marked in a conspicuous colour.
- 6.2.2 Where it is not possible to colour the objects, markers or flags shall be displayed on or above the objects.

Use of colours

- 6.2.3 The colour and form of marking displayed on objects shall be in accordance with ASC 139-5, Chapter 6.

Use of markers

- 6.2.4 Markers displayed on or adjacent to objects shall be:
 - a) located in conspicuous positions so as to retain the general definition of the object; and
 - b) recognizable in clear weather from a distance of:
 - 1000 m for an object to be viewed from the air; and
 - 300 m for an object to be viewed from the ground in all directions in which a seaplane is likely to approach the object.
- 6.2.5 The shape of the markers shall be:
 - a) distinctive to the extent necessary to ensure that they are not mistaken for markers employed to convey other information; and
 - b) such that the hazard presented by the object they mark is not increased.
- 6.2.6 The colour selected shall contrast with the background against which it will be seen.

Chapter 7 — Wildlife Strike Hazard Reduction

Note.— The presence of wildlife (birds) on and in the water aerodrome vicinity poses a serious threat to seaplane operational safety.

- 7.1 The operator of a certified water aerodrome shall develop and implement a wild life hazard management plan. The wildlife hazard on, or in the vicinity of, an water aerodrome shall be assessed through:
- a) the establishment of a procedure by the water aerodrome operator for recording and reporting wildlife strikes to seaplane;
 - b) the collection of information from aircraft operators, airport personnel and other sources on the presence of wildlife on or around the water aerodrome constituting a potential hazard to seaplane operations; and
 - c) an ongoing evaluation of the wildlife hazard by competent personnel.
- 7.2 The water aerodrome operator shall take action to decrease the risk to aircraft operations by adopting measures to minimize the likelihood of collisions between wildlife and seaplanes.
- 7.3 The aerodrome operator shall take action to eliminate or to prevent the establishment of garbage disposal dumps or any other source which may attract wildlife to the aerodrome, or its vicinity, unless an appropriate wildlife assessment indicates that they are unlikely to create conditions conducive to a wildlife hazard problem. Where the elimination of existing sites is not possible, the water aerodrome operator shall ensure that any risk to aircraft posed by these sites is assessed and reduced to as low as reasonably practicable.

Chapter 8 — Lighting of Movement Area

- 8.1 If a certified water aerodrome is available for an aircraft to land or take-off in less than Visual Meteorological Condition (VMC) during the day, the operator of the aerodrome may provide and maintain a lighting system for the movement area of the aerodrome.
- 8.2 Water aerodrome identification and manoeuvring area lighting shall be provided for reduced visibility conditions wherever necessary.
- 8.3 A lighted water aerodrome can be identified by a beacon alternating white and yellow flashes at the rate of 12 to 30 flashes per minute.
- 8.4 In water traffic congested areas, a radio activated strobe beacon may be used to alert mariners and other airman that a seaplane will be arriving or departing within a short time.
- 8.5 Floodlights or spotlights shall be installed on the shore to illuminate aprons, floats, ramps, and piers wherever necessary. Care must be taken in locating and aiming floodlights to preclude affecting the vision of pilot's landing or taking off or creating distracting reflections.

Chapter 9 — Rescue and Fire Fighting

Level of protection to be provided

- 9.1 At water aerodromes the rescue and fire-fighting vessel(s) shall be provided appropriate to the level of protection required.
- 9.2 The rescue vessel(s) provided shall be appropriate for the environment involved and they shall be capable or shall carry equipment capable of accommodating twice the maximum number of passengers carried by the largest type of seaplane serving the water aerodrome.
- 9.3 The level of protection provided at a water aerodrome for rescue and fire-fighting shall be appropriate to the water aerodrome using principles in paragraphs 9.2.4 and 9.2.5 of ASC 139-5 Aerodrome Standards.
- 9.4 Types of extinguishing agents and the amount of water for foam production and complimentary agents shall be provided on the rescue and fire-fighting vessel(s) in accordance with the aerodrome category for rescue and fire-fighting determined under Table 9-1 and Table 9-2 of ASC 139-5 Aerodrome Standards.
- 9.5 The equipment and information sufficient to navigate to and from the incident site, communicate with survivors and rescue personnel, effect entry and fire-fighting and provide medical assistance shall be provided in rescue and fire-fighting vessels.
- 9.6 A communication system shall be provided linking the water aerodrome fire station, control tower (if available), fire and rescue vessel(s), fire and rescue vehicles and any other fire station (if available) in the vicinity.
- 9.7 An alerting system for rescue and fire-fighting personnel, capable of being operated by that station, shall be provided at a fire station, any other fire station in the vicinity and the aerodrome control tower.

Personnel

- 9.8 During any period announced in Maldives - AIP as a period during which RFF is available at the aerodrome, there must be enough personnel available at the aerodrome to operate the equipment and vehicles required to provide the service at full capacity.
- 9.9 All rescue and firefighting personnel shall be properly trained to perform their duties in an efficient manner and shall participate in live fire drills commensurate with the types of aircraft and type of rescue and firefighting equipment in use at the aerodrome.
- 9.10 In determining the minimum number of rescue and firefighting personnel required, a task resource analysis shall be completed, and the level of staffing documented in the Aerodrome Manual.

- 9.11 All responding rescue and firefighting personnel shall be provided with protective clothing and respiratory equipment to enable them to perform their duties in an effective manner.
- 9.12 The people employed as firefighters shall meet the relevant internationally recognized medical standards.
- 9.13 There must be a system of continuing medical checks for the people employed as firefighters that ensures that the RFF provider knows whether or not those people continue to meet that standard.

Marine fire station

- 9.14 All rescue and firefighting vessels should normally be housed in a marine fire station.
- 9.15 The marine fire station should be located so that the access for rescue and firefighting vessels into the runway area is direct and clear.

Response time

- 9.16 For water aerodromes the operational objective of the Rescue and Fire Fighting Service shall be to achieve a response time not exceeding three (03) minutes to any point of each operational water runway, in optimum visibility and surface conditions.
- 9.17 A system of preventive maintenance of rescue and firefighting vessels shall be implemented to ensure effectiveness of the equipment and compliance with the specified response time throughout the life of the vessels.

Chapter 10 — Water Aerodrome Emergency Planning

Aerodrome Emergency Committee

- 10.1 The operator of a certified water aerodrome shall establish an aerodrome emergency committee.
- 10.2 The committee must include a representative from any fire, police or other emergency service that, having regard to the location of the aerodrome, would be likely to be asked to assist if there were an emergency at the aerodrome.

Aerodrome Emergency Plan

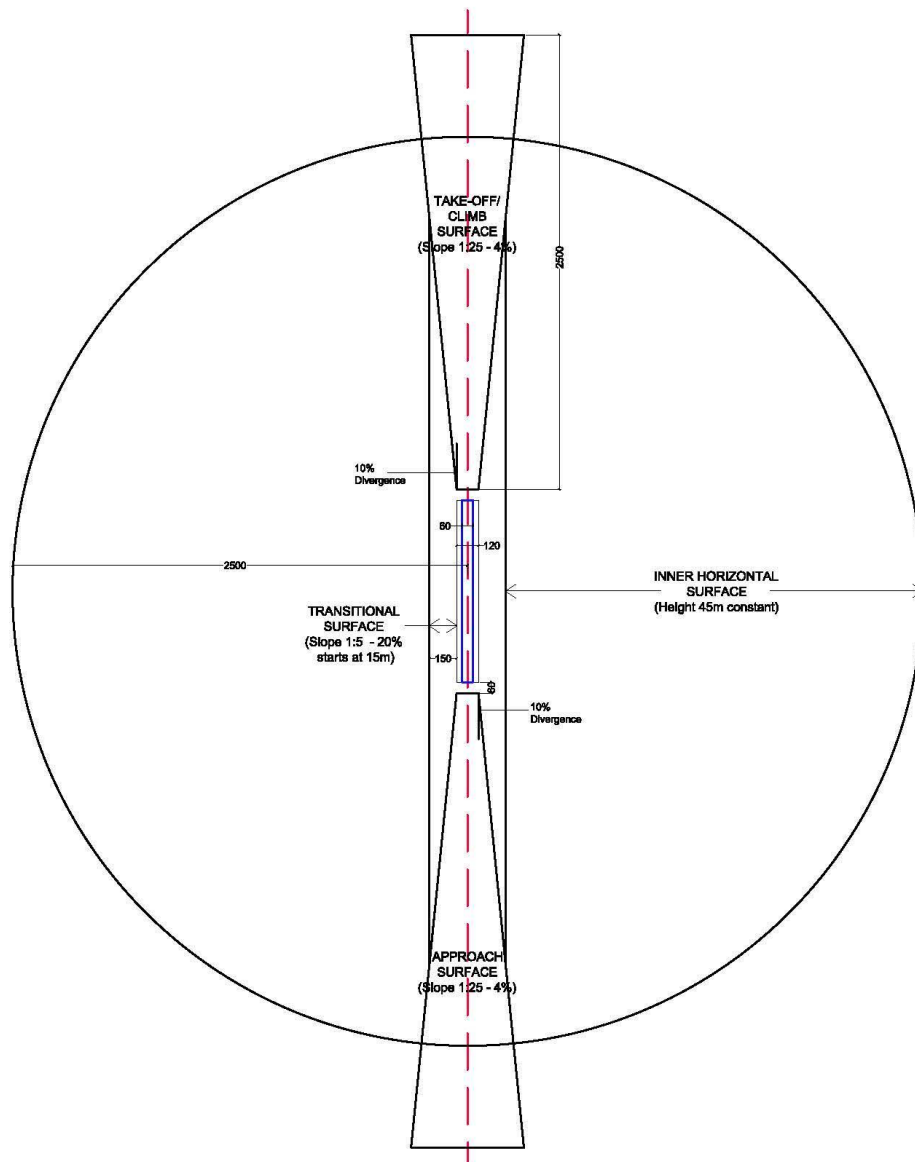
- 10.3 The operator of water aerodrome shall prepare and submit an Aerodrome Emergency Plan (AEP) for the particular water aerodrome for approval by the Maldives Civil Aviation Authority.
- 10.4 The objectives of emergency planning outlined in Chapter 9 of ASC 139-5 Aerodrome Standards applies equally to water aerodromes.
- 10.5 The emergency plan shall consider the particular hazards associated with seaplane operations, including:
 - a) passenger evacuation into a further life-threatening environment, e.g. deep water;
 - b) the onset of hypothermia, and its associated effects, during and following prolonged immersion in cold water; and
 - c) the immediate toxicity and respiratory effects on survivors in the water following the ingestion of floating fuel and oils and their associated vapours, and fire suppressant foams, powders and gases.
- 10.6 The AEP shall contain provisions for:
 - a) water rescue;
 - b) fire response; and
 - c) recovery of disabled aircraft from the movement area.
- 10.7 The AEP shall contain procedures for periodic testing of the adequacy of the plan and for reviewing the results in order to improve its effectiveness.
- 10.8 The AEP shall be tested in accordance with the ASC 139-5 Aerodrome Standards requirements.

Note.— Additional guidance on seaplane accidents in the water is outlined in Appendix 6 to the ICAO Airport Services Manual (Doc 9137) Part 7

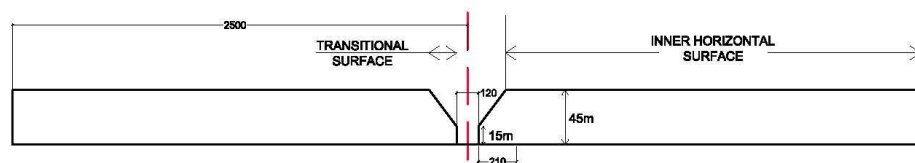
For the Civil Aviation Authority
Hussain Jaleel
Chief Executive

Appendix I – Obstacle Limitation Surface

WATER AERODROME OBSTACLE LIMITATION SURFACE



PLAN VIEW



ELEVATION

Dimensions are given in Meters
0 0.5 1.0 1.5 2.0 2.5 3.0 km

Appendix II – Curved Take-Off Climb/Approach Surface

