



*INTERNATIONAL CIVIL AVIATION ORGANIZATION*

**SECOND MEETING OF WATER AERODROME SMALL WORKING GROUP  
(WASWG/2)**

*Colombo, Sri Lanka, 29 February to 2 March 2016*

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**Agenda Item 4:      Discuss draft water aerodrome standards**

**DRAFT WATER AERODROME STANDARDS**

(Presented by WASWG Leader)

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## WATER AERODROME STANDARDS (draft)

### 1 Introduction

- 1.1 ICAO Annex 14 does not differentiate between land and water as a surface from which aircraft can operate; and Annex14 defines that an aerodrome can be an area of water,
- 1.2 Operations on water differ significantly from those conducted on land, and the licensing criteria for land aerodromes are inappropriate in some areas. Although based on the existing land aerodrome criteria, the different operational and safety risks when operating onto and from water, have been recognized and addressed.
- 1.3 The following licensing criteria focus on those licensing factors where water aerodromes differ from land aerodromes. These factors primarily include the physical characteristics of the operating environment, mooring procedures, and rescue and firefighting services; however, one fundamental licensing criterion that requires the licence holder to establish and maintain an appropriate Safety Management System (SMS) remains the same. The criteria should therefore be considered in addition to criteria outlined elsewhere in this document that apply to land and water aerodromes equally.

## 2. DEFINITIONS

For the purpose of this Circular, the licensee shall mean the certificate holder or license holder and the following definitions shall also apply:

**‘Aeroplane’** A power-driven heavier than air aircraft deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

**‘Turn Around’** An aircraft while operating a scheduled or charter flight after having reached its destination and having discharged its passengers, cargo etc. returns to its station from which the flight had earlier originated.

**‘Floating Platform’** An anchored, defined platform inside protected waters licensed under the MCAR for the purpose of embarkation and disembarkation of passengers or cargo by aircraft. (These could also mean attached jetties).

**‘Water Aerodrome’** A defined area on water and, where desired, land (including any buildings installations and equipments) intended to be used either wholly or in part for the arrival, departure and movement of aircraft.

**‘Water Runway or Channel’** A defined rectangular area on a water aerodrome, intended for the landing and take-off run of aircraft along its length. (These could also mean sea lane).

**‘Goods’** Anything taken on an aircraft as personal belongings, baggage or cargo;

**‘Response Time’** is the time between the initial call to the Rescue and Fire Fighting Services (RFFS) and the first effective intervention at the accident site by a rescue and fire fighting vessel.

**‘Resort Agent’** Person employed by the licensee who will be responsible for communication on arrival/departure of the aircraft with the operator, handling of passengers, preparing a passenger manifest and load sheet and providing assistance during emergency evacuation of the aircraft and other related emergency scenarios.

**‘Nature Reserved Designated Area’** A marine area that is environmentally protected and preserved as a reserve.

**‘Protected Area’** An area usually located on the atoll-ward side near islands, which is protected from large waves by the surrounding reef or lagoon.

## **WATER AERODROMES STANDARDS**

The Water Aerodrome Standard outlines the minimum specifications for the physical characteristics and obstacle limitation surfaces (OLS) to be provided at water Aerodromes

The standards provide a means of assessment to determine the operational use of a facility.

### **Part I - Personnel**

#### ***1.1 Requirements for Water Aerodrome Manager***

##### **(a) Qualifications**

Demonstrates knowledge to the Director with respect to content of

- (i) the Water Aerodrome Operations Manual (WAOM),
- (ii) the water Aerodrome certificate and related operational procedures; and
- (iii) the provision of regulations and standards necessary to carry out the duties and responsibilities to ensure safety.

##### **(b) Responsibilities**

The water aerodrome operator is responsible for safe water aerodrome operations. In particular, the responsibilities of the position include;

- (i) operational control of the water aerodrome;
- (ii) co-ordination of functions which impact on operational control (eg. Maintenance);
- (iii) supervision, organization, and manning of the following :
  - (A) docking;
  - (B) refueling;
  - (C) passenger safety on the aerodrome;
  - (D) staff scheduling;
  - (E) training programs; and
  - (F) a water aerodrome safety management program.

- (iv) the supervision of and the production and amendment of the WAOM.
- (v) liaison with the MCAA in all matters concerning water aerodrome operations, including modifications to the WAOM;
- (vi) liaison with any external agencies which may affect water aerodrome operations;
- (vii) ensuring that the water aerodrome operations are conducted in accordance with current regulations, standards and WAOM;
- (viii) ensuring that all staff members are kept informed of any changes to the regulations and standards;
- (ix) the distribution of related accident, incident and other water aerodrome occurrence reports;
- (xi) the receipt and actioning of any aeronautical information affecting the safety of the water aerodrome;
- (xii) the dissemination of water aerodrome safety information, both internal and external, in conjunction with the water aerodrome safety management program;
- (xiii) qualifications of staff members;
- (xix) maintenance of a current water aerodrome operations library; and
- (xix) in his or her absence all responsibilities for operational duties shall be delegated to another qualified individual, except that the knowledge requirements detailed under aerodrome manager qualifications may be demonstrated to the water aerodrome management rather than the MCAA

## **Part II - Licensing Criteria - Units of Measurement**

### ***2.1 Units of Measurement***

Except as specified, the following units of measurement shall be given:

- (1) elevations to the nearest foot;
- (2) linear dimensions to the nearest one-half meter;
- (3) geographic co-ordinates in latitude and longitude to the nearest second;
- (4) geographic co-ordinates measured in accordance with the WGS 84 reference datum;
- (5) bearings given to the nearest degree;
- (6) water depths to nearest foot; and

(7) tides measured with respect to zero tides.

### **Part III - Licensing Criteria - 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 Operations Manual (WAOM)**. This Part is also used to define the characteristics of water aerodrome data that is to be made available through the aeronautical information publications and/or disseminated through an aeronautical information service.*

#### **3.1 Geographic Data**

##### **(1) Geometric Centre**

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

##### **(2) Water Aerodrome Elevation**

Not Applicable

##### **(3) Water Aerodrome Magnetic Variation**

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

##### **(4) Electronic Navigation Aids**

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

- (a) the geographic co-ordinates of the antenna or radiating centre to the nearest 1/10 second;
- (b) the elevation of the antenna or radiating centre; and
- (c) the bearing of any unidirectional navigation signal (e.g. ILS localizer course).

#### **3.2 Water Aerodrome Dimensions and Related Information**

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

- (a) take-off and landing areas:
  - (i) true bearing;
  - (ii) length;

(iii) width;

(iv) depth of water; and

(v) water current.

(b) turning basins:

(i) size;

(ii) length;

(iii) width or circumference; and

(iv) depth of water.

(c) taxi areas:

(i) width; and

(ii) depth of water.

(d) shore facility:

(i) type; and

(ii) depth at shore;

(e) 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.

(f) marking

(i) location, landing channels;

(ii) taxi channels; and

(iii) hazardous areas.

### ***3.3 Provision of Operational Information***

#### **(a) Movement Area and Related Facilities**

- (i) Information on the condition of the movement area and the operational status of related facilities shall be given to the appropriate aeronautical information service;
- (ii) Information of operational significance shall be given to the appropriate air traffic services units;
- (iii) The information shall be kept up to date; and
- (iv) The condition of the movement area and the operational status of related facilities shall be monitored and reports of operational significance or affecting aircraft performance given, in respect of :
  - (A) damage to shore 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) currents; and
  - (F) tidal areas, depth of water at high and low tides or seasonal changes.

**(b) Take-off and Landing Area**

Information on take-off and landing area shall consist of :

- (i) the tidal range;
- (ii) the times of high and low tide; and
- (ii) the approximate speed and direction of the current.

**Part IV - Licencing Criteria - Physical Characteristics**

**4.1 Physical Characteristics**

**(a) Take-off and Landing Area**

**(i) General**

In some cases, the available manoeuvring area will be large enough to provide a choice of take-off and landing direction, dependent upon prevailing water surface and weather conditions. For the purpose of this Chapter, this type of manoeuvring area is termed 'omnidirectional'. However, in other cases, such as on a lagoon or inner harbour, it may be more appropriate to provide a manoeuvring area that caters for take-off and landing in one direction and its reciprocal only, in a direction parallel to the longer sides of the



manoeuvring area. This type of manoeuvring area is termed 'bidirectional'. Unless specified otherwise, the licensing criteria apply to both types of manoeuvring area.

(ii) **Dimensions**

(A) Length

The primary take-off and landing area shall not be less than 800 m (2666 ft).

(B) Width

The width of the take-off and landing area shall not be less than 60 m (200 ft).

(C) Water Depth

The depth of the water in the take-off and landing area shall not be less than 1.8 m (6 ft).

(D) Take-off and Landing Area Strip

(I) a strip shall extend on each side from the edge of the take-off and landing area to a distance not less than 30 m (100 ft);

(II) the depth of the water in the take-off and landing area strip shall not be less than 1.8 m (6 ft); and

(III) the total width of the strip shall not be less than a width of 120 m (400 ft).

*Note 1: The depth of an area is the minimum depth of water at low water level that is to be expected anywhere in the area.*

*Note 2: Where strong cross-winds exist, a secondary take-off and landing area should be considered.*

(b) **Turning Basins**

(i) Turning basins shall be provided adjacent to the ends of the take-off and landing areas.

(ii) Turning basins shall have :

(A) a diameter measured at low water level to permit the turning of the aeroplanes using the facility;

(B) a radius no less than 150 feet (45 m); and

(C) a horizontal obstruction clearance between the edge of the turning basin and the nearest obstacle of no less than 50 feet (15 m).

**(c) Taxi Areas**

- (i) Taxiway areas shall be provided when there is potential for conflict with aircraft taking off or landing.
- (ii) Taxiway areas shall have a width, measured at low level, of not less than 45 m (150 ft).
- (iii) Taxiway areas shall have a depth, measured at low level, of not less than 1.8 m (6 ft).

**(d) Dock Areas**

The dock area shall be designed in such a manner as to provide a minimum clearance of 1.8 m (6 ft) between an aircraft wing and any object it could come into contact with.

**(e) Shore Facilities**

A dock, wharf, ramp or beach shall be provided to emplane and deplane passengers.

- (i) Where a dock or wharf is provided it shall:
  - (A) be in a condition that permits constant use without 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 bullrails or tiedown cleats at each aircraft parking position to secure aircraft.
- (ii) When an aircraft is normally secured in a position where any aircraft component overhangs the dock and constitutes a hazard to the movement of crew and passengers, the hazard shall be clearly indicated by means of
  - (A) cones; and or
  - (B) hashed paint markings;
  - (C) in a manner easily identifiable to crew and passengers.
- (iii) 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 aircraft intended to use the facility;
  - (B) located in such a manner as to provide a minimum clearance of 1.8 m (6 ft) between an aircraft wing and any object it could come into contact with; and

(C) constructed with a slope not steeper than 8:1.

*Note: Some amphibian aircraft may be damaged while entering the water if ramp slopes exceed 8:1.*

## **Division IX - Licensing Criteria - Obstacle Limitation Surfaces and Objects**

This Division 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 an entirely visual approach or during the visual segment of an instrument approach.

### **5.1 Obstacle Limitation Surfaces**

#### **(1) General**

- (a) The following OLS shall be established for non-instrument day-VFR water aerodromes:
  - (i) a take-off /approach surface; and
  - (ii) a transitional surface.

#### **(2) Take-off/approach Surface**

- (a) The take-off/approach surface shall be either straight or curved.
- (b) The take-off/approach surface shall be established at the end of the take-off and landing area(s) of the water aerodrome.
- (c) The length of the inner edge shall not be less than be 60 m (200 ft).
- (d) The inner edge shall be positioned at the threshold.
- (e) The elevation of the inner edge shall be the elevation of the water aerodrome.
- (f) The length of the take-off/approach surface shall not be less than 2500 m (8333 ft).
- (g) The slope of the take-off/approach surface shall be a maximum of 5 % (1:20).
- (h) The centre line of the take-off/approach surface shall
  - (i) define the approach path; and
  - (ii) be
    - (A) a straight line;
    - (B) an arc of constant radius; or

(C) a combination of a straight line and an arc of constant radius.

### **(3) Straight-in Take-off/approach Surface**

Where the slope is designed for a straight-in approach

- (a) the divergence of the take-off/approach surface shall be set at 10% starting from the inner edge; and
- (b) the diverging sides of the take-off/approach surface shall meet the vertical portion of the transitional surface at a point 300 m (1000 ft) from the inner edge.

### **(4) Curved Take-off/approach Surfaces**

- (a) Where established, a curved take-off /approach surface shall not contain more than one curved portion.
- (b) A curved portion of a take-off/approach surface shall not allow a change of direction greater than 90 degrees.
- (c) Where a curved portion of take-off/approach is provided,
  - (i) the straight portion originating at the inner edge shall not be less than 1300 m (4265 ft); and
  - (ii) the radius of arc defining the centre line of the take-off/approach surface shall not in any portion of the take-off/approach surface be less than 736 m (2415 ft) in accordance with Figure 5.
- (d) A take-off/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 day VFR facility 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).*

### **(5) Transitional Surface**

- (a) The Transitional Surface shall be an unobstructed plane running parallel to the take-off/approach area where
  - (i) The first portion of the transitional surface shall be vertical, commencing not less than a distance of 30m (100 ft) from each side of the take-off /approach area, and shall extend to a height of 15 m (50 ft) above the water level in accordance with **Figure 3**; and

- (ii) The second portion of the transitional surface shall start at the top of the first portion and shall extend at a slope of 50% (1:2) to meet the take-off/approach surface at a height of 45 m (150ft) above the water level in accordance with **Figure 3**.

<b>Table 1 - Dimensions and Slopes of Obstacle Limitation Surfaces - Water Aerodromes</b>	
	Approach Type
	Non - Instrument/Day - VFR
<b>Take-Off/Approach Surface</b>	
Width of inner edge	Width of take-off and landing area - (120 m minimum)
Location of inner edge	Positioned at the threshold
Divergence	10 %
Length (minimum)	2500 m
Slope (maximum)	5 % (1:20)
<b>Transitional Surface:</b>	
<b>Slope (maximum)</b>	<b>Vertical to 15 m then (1:2) 50%</b>
<b>Height</b>	<b>45 m</b>

#### **(6) Displaced Threshold**

- (a) Where the integrity of the take-off /approach surface can not be maintained due to fixed or mobile obstacles, a landing threshold shall be displaced from the normal threshold.
- (b) This displacement shall be established so that the new take-off /approach surface, starting at the displacement, will clear all obstacles.
- (c) Where a threshold has been displaced, the inner edge shall be located at the point of displacement.

- (d) The Landing Distance Available (LDA) shall be reduced by an amount equal to the displacement.
- (e) The LDA from the point of displacement shall be equal to or greater than 600m (2000 ft).
- (f) Where a threshold is displaced,
  - (i) landing distances shall be calculated; and
  - (ii) declared distances and threshold displacements shall be published and in a NOTAM, where the NOTAM is published earlier.

### **(7) Displaced Threshold Markings**

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 markers shall be coloured international orange and white or
- (d) the markers shall be alternating international orange and white

*Note 1: A displaced threshold effects only the LDA for approach made to the take-off and landing area. . The declared distances for the reciprocal take-off and landing area remain unaffected.*

### **(8) Objects and Obstacles**

- (a) No fixed object shall be permitted on a take-off and landing area or on a take-off and landing area strip.
- (b) Objects or structures that are located within the water aerodrome boundary shall not penetrate OLS unless;
  - (i) those structures are for air navigation purposes; or
  - (ii) are essential to the safety of aircraft operation; and
  - (iii) are marked, in accordance with section 326.49; and
  - (iv) are frangible.
- (c) Except as in (d), a mobile object shall not penetrate a take-off/approach or the transitional surface.

- (d) A mobile object shall not be permitted above a take-off/approach or transitional surface, unless procedures are in place to ensure the object is removed during approach and departure operations.

## **(9) Other Objects**

- (a) Where an Aeronautical Safety Analysis indicates that an object is hazardous to aircraft located on the movement area or in the air in the immediate vicinity of the water aerodrome, it shall be
  - (i) removed; or
  - (ii) marked; and/or
  - (iv) lightedin accordance with section 326.49.
- (b) The water aerodrome operator shall conduct an Aeronautical Safety Analysis, to establish the required clearances to be used above waterways, lagoons, or harbours.

## **Division X - Certification Criteria - Visual Aids for Navigation**

### **6.1 Wind Indicators**

- (1)** Unless the direction of the wind can be determined by radio, a wind direction indicator shall be installed.
- (2)** Where a wind direction indicator is installed it shall be;
  - (a) of a conspicuous colour;
  - (b) in the form of a truncated cone;
- (3)** The wind direction indicator shall be;
  - (a) visible at a height of 1000 feet above the indicator; and
  - (b) visible from any portion of the manoeuvring area.

### **6.2 Markings**

#### **(1) Dock Identification Marking**

- (a) Characteristics
  - (i) Dock identification markings shall be installed.

- (ii) Dock identification markings shall consist of
  - (A) a triangle;
  - (B) bullrails; or
  - (C) both.
- (iii) Markings shall be affixed to the upper surface of the dock so as to be visible from 300 m (1000 ft) above the landing area.
- (b) Where bullrails are installed they shall be painted in alternated bands of international orange and white stripes.
- (c) Gangways shall be
  - (i) painted red; or
  - (ii) signage provided indicating seaplane access only.

## **(2) Marker Buoys**

### **(a) Characteristics**

Marker buoys shall be visible to aircraft manoeuvring

- (i) on the surface of water; and
- (ii) 300 m (1000 ft) above the landing area.

### **(b) Take-off and Landing Area Markers**

- (i) Except as specified in (ii) at water aerodromes where there is no conflict with marine traffic or marine regulations;
  - (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 markers shall be
    - (I) coloured international orange and white; or
    - (II) alternating international orange and white.
- (ii) Where it is impracticable to mark the take-off and landing area as specified in (i),



(A) guidance such as geographical points and/or other visual references shall be provided to designate the take-off and landing area; and

(B) these visual references shall be identified and published.

(c) Hazardous Areas

(i) Where shoals or other hazards could endanger an aeroplane, marker buoys shall be installed to clearly indicate the hazardous area.

(ii) Marker buoys for delineating hazardous area shall be coloured international orange.

### **6.3 Signs**

#### **(1) Prohibition Signs**

(a) A sign shall be provided and displayed on the dock restricting the dock to aircraft only.

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

### **6.4 Strobe Lights**

Where installed, the strobe lights shall be;

(a) white, quick flashing;

(b) located in an area that is easily and constantly seen by both marine and air traffic; and

(c) radio activated or activated by the water aerodrome operator or designated agency.

## **Division XI - Licensing Criteria - Visual Aids for Denoting Obstacles**

### **7.1 Objects to be Marked and/or Lighted**

#### **Fixed Objects**

##### **(1) General**

(a) Objects that are conspicuous by their shape, size or colour need not be marked.

##### **(2) Types of Markings**

Except as covered under the Marine Act, objects shall be marked in accordance with *regulatory requirement*.

## **7.2 Marking of Objects**

### **(1) General**

- (a) Except as in paragraphs 1 (a) all fixed objects shall be marked with a conspicuous colour.
- (b) Where it is not possible to colour the objects, markers or flags shall be displayed on or above them.
- (c) Objects that are conspicuous by their shape, size, or colour need not be marked.

### **(2) Use of Colours**

The colour and form of marking displayed on objects shall be in accordance with *Annex 14*.

### **(3) Use of Markers**

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

## **Division XII - Licensing Criteria - Visual Aids For Denoting Restricted Use Areas**

## **9. Bird Hazard Management Program**

### **Bird Strike Hazard**

- 9.1 Licence holders should provide a bird hazard management plan that includes the identification of the risk and hazards that may exist, and suitable mitigation measures.
- 9.2 All reasonable measures should be taken to discourage birds from gathering in the movement area, and under anticipated departure and arrival flight paths.