*INTERNATIONAL CIVIL AVIATION ORGANIZATION*

**THE SECOND MEETING OF THE APANPIRG AERODROMES OPERATIONS AND PLANNING – WORKING GROUP (AOP/WG/2)**

Yogyakarta, Indonesia, 3 – 5 June 2014

**Agenda Item 4: Provision of AOP in the Asia/Pacific Region**

# RESCUE AND FIRE FIGHTING REGULATORY REQUIREMENT AT ELEVATED HELIPORT

(Presented by Malaysia)

**SUMMARY**

This paper presents the Standards for Elevated Heliport applicable in Malaysia. The specifications in this Directive apply to the approval, licensing or certification of elevated heliports in Malaysia, and inclusive of Rescue and Fire Fighting Regulatory Requirements.

This paper relates to –

**Strategic Objectives:**

*A:* ***Safety –*** *Enhance global civil aviation safety*

*B:* ***Air Navigation Capacity and Efficiency –*** *Increase Capacity and improve efficiency of the global civil aviation system*

Action by the Meeting is at Para 3 to this Working Paper.

## 1. INTRODUCTION

1.1 The First Meeting of Aerodrome Operations and Planning Working Group (AOPWG/1 – Bangkok, 21–23 May 2013) invited Malaysia, Philippines and USA to share their experience on rescue and firefighting regulatory requirements applicable at elevated heliports in their respective countries.

1.2 Article 37 of the Convention on International Civil Aviation (Chicago 1944) requires States to adopt the international SARPS and procedures developed by ICAO to secure the highest practicable degrees of uniformity in State's regulation, standards and procedures.

## 2. DISCUSSION

2.1 The Standards for Elevated Heliport [Airport Standards Directive 903] has been published and enforced by the Director General of Civil Aviation Malaysia under the provision of the Section 24o, Civil Aviation Act 1969 (Act 3) – Amendment 2003. The specification in this Directive shall apply to the approval, licensing or certification of elevated heliports in Malaysia with effect from September 2005.

2.2 The Airport Standards Directive 903 has been established in accordance with SARPS specified in ICAO Annex 14, Volume II and guidelines contained in ICAO Heliport Manual (Doc 9261).

2.3 The Airport Standards Directive 903 is provided in the **Attachment A** for review by the Meeting.

## 3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matters as appropriate.

…….

# AIRPORT STANDARDS DIRECTIVE 903 [ASD 903]

# STANDARDS FOR ELEVATED HELIPORT

**AIRPORTS STANDARDS DIVISION**
**DEPARTMENT OF CIVIL AVIATION MALAYSIA**

**This Airport Standards Directive is published and enforced by the Director General of Civil Aviation Malaysia under the provision of the Section 24o Civil Aviation Act 1969 (Act 3).**



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# INTRODUCTION

1. This Airport Standards Directive contains specifications that prescribe the physical characteristics, obstacle limitation surfaces, facilities and technical services that shall be provided at elevated heliports.

2. This Directive has been written in general terms. Specific advice could be obtained from the Authority at:

Department of Civil Aviation
Airport Standards Division
Level 1 Block Podium B 4G4 Precinct 4
Federal Government Administration Offices
62570 Putrajaya.
Phone: 03-88714000
Fax : 03-88714335

# APPLICABILITY

3. The specification in this Directive shall apply to the approval, licensing or certification of elevated heliports.

4. Elevated heliports are heliports located on raised structure on land.

# AUTHORITY

5. The Authority referred to in this Directive is the Director General of Civil Aviation.

# HELIPORT DOCUMENTATION

## 1. AERODROME MANUAL

6.1 The aerodrome manual is a fundamental requirement for the approval, licensing or certification of elevated heliports.

6.2 The aerodrome manual shall contain all pertinent information concerning the heliport site, facilities, services, equipment, operating procedures, organization and management.

6.3 The information presented in the aerodrome manual shall demonstrate that the heliport conforms to specifications of Airport Standards Directive 903, other relevant Directives, the Civil Aviation Regulations 1996 and the Civil Aviation Act 1969.

6.4 The Aerodrome Manual shall take the form and contains information as detailed in Appendix A.

## 2. GEOGRAPHICAL COORDINATES

7.1 Geographical coordinates indicating latitude and longitude shall be determined and reported in terms of the World Geodetic System – 1984 [WGS-84] geodetic reference datum.

7.2 The order of accuracy of the field work shall be such that the resulting operational navigation data for the phases of flight will be within the maximum deviations, with respect to an appropriate reference frame, as indicated herein –

a. significant obstacles on and in the vicinity of the heliport and positions of radio navigation aids located on the heliport: three meters;

b. geometric centre of the FATO/TLOF: one meter; and

c. heliport reference point: thirty meters.

## 3. HELIPORT REFERENCE POINT

8.1 A heliport reference point shall be established for an elevated heliport.

8.2 The heliport reference point shall be located near the initial or planned geometric centre of the heliport and shall normally remain where first established.

8.3 The position of the heliport reference point shall be measured and reported in degrees, minutes and seconds.

## 4. HELIPORT ELEVATIONS

9.1 The heliport elevation shall be measured and reported to the nearest meter.

## 5. HELIPORT DIMENSIONS

10.1 The following data shall be measured or described, as appropriate, for each facility provided on a heliport –

a. heliport type;

b. FATO/TLOF – true bearing, designation number [where appropriate], dimension, slope, surface type, bearing strength in tonnes;

c. safety area – length, width and surface type; and

d. visual aids for approach procedures, markings and lighting of FATO/TLOF.

10.2 The geographical coordinates of the geometric centre of the FATO/TLOF shall be measured and reported in degree, minutes, seconds and hundredths of seconds.

10.3 The geographical coordinates of significant obstacles on and in the vicinity of the heliport and positions of radio navigation aids located on the heliport shall be measured and reported in degree, minutes, seconds and tenths of seconds. In addition, the top elevation rounded up to the nearest meter, marking and lighting [if any].

## 6. DECLARED DISTANCES

11.1 The following distances shall be declared, where relevant, for a heliport –

a. take-off distance available [TODA];

b. rejected take-off distance available [RTODAH]; and

c. landing distance available [LDA].

11.2 Take-off distance available shall be the measured distance of the length of the FATO.

11.3 Rejected take-off distance available shall be the measured distance of the length of the FATO which includes the distance which is declared available and suitable for performance class 1 helicopter to safely complete a rejected take-off. The RTODAH must have a surface which is resistant to the effects of rotor downwash, be free of irregularities which could affect the safe landing of helicopters and have a bearing strength sufficient to accommodate the rejected take-off by performance class 1 helicopter.

11.4 Landing distance available shall be the measured distance of the length of the FATO plus the length of any additional area declared available and suitable for helicopters to complete the landing manoeuvre from height of 30 m. The surface of the additional area must have the same characteristics as the FATO.

## 7. RESCUE AND FIRE FIGHTING

12.1 The level of protection described as Category of rescue and fire fighting services shall be reported.

# PHYSICAL CHARACTERISTICS

## 8. FINAL APPROACH AND TAKE-OFF AREA AND TOUCHDOWN AND LIFT-OFF AREA [FATO/TLOF]

13.1 On elevated heliport, it is presumed that the FATO area and TLOF area will be coincidental.

13.2 A FATO/TLOF is an area which a helicopter completes the approach manoeuvre to a hover and land or lift-off the surface and commences movement into forward flight in the take-off manoeuvre.

13.3 An elevated heliport shall be provided with at least one FATO/TLOF.

13.4 The FATO/TLOF dimensions shall be -

i. for a heliport intended to be used by performance class 1 helicopters – as prescribed in the helicopter flight manual except that, in the absence of width specification – with width that shall be not less than 1.5 times the overall length/width, whichever is greater, of the longest/widest helicopter that the heliport is intended to serve.

ii. for a heliport intended to be used by performance class 2 – as prescribed in the helicopter flight manual - of sufficient size to contain an area within which can be drawn a circle whose dimension is not less than 1.5 times the overall length/width, whichever is greater, of the longest/widest helicopter that the heliport is intended to serve.

- however, local conditions such as elevation and temperature may need to be considered when determining the size of FATO/TLOF to ensure economical viability of the heliport.

13.5 The over-all slope in any direction on the FATO/TLOF shall not exceed 3 per cent. No portion of the FATO/TLOF shall have a local slope exceeding –

i. 5 per cent where the heliport is intended to be used by performance class 1 helicopters; and

ii. 7 per cent where the heliport is intended to be used by performance class 2 helicopters.

13.6 The surface of the FATO/TLOF –

i. shall be resistant to the effects of rotor downwash; and

ii. shall be free of irregularities that would adversely affect the take-off or landing of helicopters.

13.7 The FATO/TLOF shall be capable of withstanding traffic of helicopters the heliport is intended to serve. Design considerations shall take into account additional loading resulting from presence of personnel, freight, refuelling, fire fighting equipment ect.

## 9. SAFETY AREA

14.1 A safety area is intended to –

i. reduce the risk of damage to a helicopter caused to move off the FATO/TLOF by effect of turbulence or cross-wind, mislanding or mishandling; and

ii. protect helicopters flying over the area during landing, missed approach or take-off by providing an area which is cleared of all obstacles except small, frangible objects which, because of their function, must be located on the area.

14.2 A FATO/TLOF shall be surrounded by a safety area.

14.3 A safety area surrounding a FATO/TLOF intended to be used in visual meteorological condition shall be extended outwards from the periphery of the FATO/TLOF for a distance of at least 3 m or 0.25 times the over-all length/width, whichever is greater, of the longest/widest helicopter that the elevated heliport is intended to serve.

14.4 No objects shall be permitted on a safety area, except for frangible objects, which, because of their function, must be located on the area. No mobile object shall be permitted on a safety area during helicopter operations.

14.5 Objects whose functions require them to be located on the safety area shall not exceed a height of 25 cm when located along the edge of the FATO/TLOF nor penetrate a plane originating at a height of 25 cm above the edge of the FATO/TLOF and sloping upwards and outwards from the edge of the FATO/TLOF at a gradient of 5 per cent.

14.6 The surface of the safety area shall not exceed an upward slope of 4 per cent outwards from the edge of the FATO/TLOF.

14.7 The surface of the safety area shall be treated to prevent flying debris caused by rotor downwash.

14.8 The surface of the safety area abutting the FATO/TLOF shall be continuous with the FATO/TLOF and be capable of supporting, without structural damage, the helicopter that the heliport is intended to serve.

## 10. SAFETY NET

15.1 A safety net should be installed where there is a sheer drop from the edges of the heliport and the free movement of passengers and heliport personnel cannot be made without some risk.

15.2 The safety net shall extend outwards to at least 1.5 m from the edges of the safety area and be capable of withstanding, without damage, a 75 kg mass being dropped from a height of 1 m.

15.3 The safety net shall provide hammock effect for person falling into it rather than the trampoline effect produced by some rigid materials.

# OBSTACLE RESTRICTION

## 11. OBSTACLE LIMITATION REQUIREMENTS

16.1 The following obstacle limitation surfaces shall be established for a precision approach FATO :

a. take-off climb surface;

b. approach surface;

c. transitional surface; and

d. conical surface.

16.2 The following obstacle limitation shall be established for a non-precision approach FATO :

a. take-off climb surface;

b. approach surface;

c. transitional surface; and

d. conical surface if an inner horizontal is not provided.

16.3 The following obstacle limitation surfaces shall be established for a non-instrument approach FATO :

a. take-off climb surface; and

b. approach surface.

16.4 An elevated heliport shall have at least two take-off climb and approach surfaces, separated by not less than 150º. Elevated heliport provided with one take-off climb and approach surfaces will be enforced with restrictions on its use.

16.5 The slopes of the surfaces shall not be greater than, and their dimensions not less than those specified in Appendix B to E.

16.6 All height and slope dimensions shall be relative to a datum which shall be a horizontal plane whose elevation is the elevation of the elevated FATO/TLOF.

16.7 New objects or extension of existing objects shall not be permitted above any of the surfaces in 16.1 to 16.3 above except when, in the opinion of the Authority, the new object or extension would be shielded by an existing immovable object.

16.8 Existing objects above any of the obstacle limitation surfaces in 16.1 to 16.3 should, as far as practicable be removed except when, in the opinion of the Authority, the object is shielded by an existing immovable object or, after an aeronautical study, that the object would not adversely affect the safety or significantly affect the regularity of operations of helicopters.

16.9 The application of curved take-off climb surfaces may alleviate the problems created by objects infringing these surfaces.

## 12. APPROACH SURFACE

17.1 The approach surface is an inclined plane or combination of planes sloping upwards from the end of the safety area and centred on a line passing through the centre of the FATO/TLOF.

17.2 The limits of an approach surface shall comprise –

a. an inner edge horizontal and equal in length to the minimum specified width of the FATO/TLOF plus the safety area, perpendicular to the centreline of the approach surface and located at the outer edge of the safety area;

b. two side edges originating at the ends of the inner edge and –

i. for other than a precision approach FATO/TLOF, diverging uniformly at a specified rate from the vertical plane containing the centreline of the FATO/TLOF; or

ii. for a precision approach FATO/TLOF, diverging uniformly at a specified rate from the vertical plane containing the centreline of the FATO/TLOF, to a specified height above the FATO/TLOF, and then diverging uniformly at a specified rate to a specified final width and continuing thereafter at that width for the remaining length of the approach surface. and

c. an outer edge horizontal and perpendicular to the centreline of the approach surface and at a specified height above the elevation of the FATO/TLOF.

17.3 The elevation of the inner edge shall be the elevation of the safety area at the point the inner edge that is intersected by the centreline of the approach surface.

17.4 The slope[s] of the approach surface shall be measured in the vertical plane containing the centreline of the surface.

17.5 The areas between the inner edge of the approach surface and the safety area shall have the same characteristics as the safety area.

17.6 The approach path is to be selected so as to permit safe forced landings or one-engine-inoperative landings such that, as a minimum requirement, injury to occupants of the helicopter, person on the ground or water or damage to property is minimized.

## 13. **TRANSITIONAL SURFACE**

18.1 The transitional surface is a complex surface along the side of the safety area and part of the side of the approach surface that slope upwards and outwards to the inner horizontal surface or a predetermined height.

18.2 The limits of a transitional surface shall comprise -

a. a lower edge beginning at the intersection of the side of the approach surface with the inner horizontal surface or beginning at a specified height above the lower edge when an inner horizontal surface is not provided, an extending down the side of the approach surface to the inner edge of the approach surface and from there along the length of the side of the safety area parallel to the centreline of the FATO/TLOF; and

b. an upper edge located in the plane of the inner horizontal surface, or at a specified height above the lower edge when the inner horizontal surface is not provided.

18.3 The elevation of a point on the lower edge shall be -

a. along the side of the approach surface – equal to the approach surface at that point; and

b. along the safety area – equal to the elevation of the centreline of the FATO/TLOF opposite that point.

18.4 The transitional surface along the safety area will be curved if the profile of the FATO/TLOF is curved, or a plane if the profile is a straight line. The intersection of the transitional surface with the inner horizontal, or upper edge when an inner horizontal surface is not provided, will also be curved or a straight line depending on the profile of the FATO/TLOF.

18.5 The slope of the transitional surface shall be measured in a vertical plane at right angles to the centreline of the FATO/TLOF.

## 14. **INNER HORIZONTAL SURFACE**

19.1 An inner horizontal surface should be provided where straight-in non-precision instrument approaches are not available at both ends of the FATO/TLOF.

19.2 The inner horizontal surface is a circular surface located in the horizontal plane above the FATO/TLOF and its environs.

19.3 The radius of the inner horizontal surface shall be measured from the mid-point of the FATO/TLOF.

19.4 The height of the inner horizontal surface shall be measured above an elevation datum which is the elevation of the FATO.

15. **CONICAL SURFACE**

20.1 The conical surface is a surface sloping upwards and outwards from the periphery of inner horizontal surface, or from the outer limit of the transitional surface if an inner horizontal surface is not provided.

20.2 The limits of a conical surface shall comprise -

a. a lower edge coincident with the periphery of the inner horizontal surface, or the outer limit of the transitional surface if an inner horizontal surface is not provided.

b. an upper edge located at a specified height above the inner horizontal surface, or above the elevation of the FATO/TLOF if an inner horizontal surface is not provided.

20.3 The slope of the conical surface shall be measured above the horizontal.

16. **TAKE-OFF CLIMB SURFACE**

21.1 The take-off climb surface is an inclined plane, a combination of planes or, when a turn is involved, a complex surface sloping upwards from the end of the safety area an centred on a line passing through the centre of the FATO.

21.2 The limits of a take-off climb surface shall comprise –

a. an inner edge horizontal and equal in length to the minimum specified width of the FATO/TLOF plus the safety area, perpendicular to the centreline of the take-off climb surface and located at the outer edge of the safety area;

b. two side edges originating at the ends of the inner edge and diverging uniformly at a specified rate from the vertical plane containing the centreline of the FATO/TLOF; and

c. an outer edge horizontal and perpendicular to the centreline of the take-off climb surface and at a specified height above the elevation of the FATO/TLOF.

21.3 The elevation of the inner edge shall be the elevation of the safety area at the point the inner edge that is intersected by the centreline of the take-off climb surface.

21.4 In the case of straight take-off climb surface, the slope shall be measured in the vertical plane containing the centreline of the surface.

21.5 In the case of straight take-off climb surface involving a turn, the surface shall be a complex surface containing the horizontal normals to its centreline and the slope of the centreline shall be the same as for a straight take-off climb surface. The portion of the surface between the inner edge and 30 m above the inner edge shall be straight.

21.6 Any variation in the direction of the centreline of the take-off climb surface shall be designed so as not to necessitate a turn of radius less than 270 m.

21.7 The departure path is to be selected so as to permit safe forced landings or one-engine-inoperative landings such that, as a minimum requirement, injury to occupants of the helicopter, person on the ground or water or damage to property is minimized.

# VISUAL AIDS

17. A heliport meant for use by day and then only in good visibility conditions will need to display markings only. On the other hand, if the heliport is intended for use by night or in restricted visibility conditions by day or night it will need to be lighted as well.

## 18. WIND DIRECTION INDICATOR

23.1 A heliport shall be equipped with at least one wind direction indicator.

23.2 A wind direction indicator shall be constructed so that it gives a clear indication of the direction of the wind and a general indication of the wind speed.

23.3 A wind direction indicator shall be located so as to indicate the wind conditions over the FATO/TLOF area and in such a way as to be free from the effects of airflow disturbances caused by nearby objects or rotor downwash. It shall be visible from a helicopter in flight, in a hover or on the movement area.

23.4 A wind direction indicator shall be a truncated cone made of lightweight fabric and shall have minimum dimensions of 2.4 m in length, 0.6 m diameter at larger end and 0.3 m diameter at smaller end. However, the indicators may be half the size to accommodate space limitations at elevated heliports.

23.5 The colour of the wind direction indicator should be so selected so as to make it clearly visible and understandable, having regard to background. Where practicable, a single colour, orange should be used. Where a combination of two colours is required to give adequate conspicuity against changing backgrounds, they should be orange and white, or red and white, and should be arranged in five alternate bands the first and last band being the darker colour.

23.6 A wind direction indicator shall at a heliport intended for use at night shall be illuminated.

## 19. MARKINGS

24.1 The following markings shall be provided for a heliport –

a. heliport identification marking;

b. TLOF area marking;

c. touchdown marking; and

d. maximum allowable mass marking.

24.2 Under certain operational circumstances, the following markings shall also be provided for a heliport -

a. FATO/TLOF area designation marking; and

b. heliport name marking.

## 24.3 HELIPORT IDENTIFICATION MARKING

24.3.1 A heliport identification marking shall be provided at a heliport.

24.3.2 A heliport identification marking shall be located within the FATO/TLOF area, at or near the centre of the area.

24.3.3 A heliport identification marking, except for a heliport at a hospital, shall consist of a letter H, white in colour. The dimensions of the marking shall be no less than those shown in Appendix F.

24.3.4 A heliport identification marking for a heliport at a hospital shall consist of a letter H, red in colour, on a white cross made of squares adjacent to each of the sides of a square containing the H as shown in Appendix F.

24.3.5 A heliport identification marking shall be orientated so that the cross arm of the H at right angles to the preferred final approach direction.

## 24.4 TLOF AREA MARKING

24.4.1 A TLOF area marking shall be provided at a heliport.

24.4.2 A TLOF area marking shall be located along the perimeter of the TLOF area.

24.4.3 A TLOF area marking shall be consist of a continuous white line with a width of at least 30 cm.

## 24.5 TOUCHDOWN MARKING

24.5.1 A touchdown marking shall be provided at an elevated heliport.

24.5.2 A touchdown marking shall be located so that when a helicopter for which the marking is intended is positioned, with the main undercarriage inside the marking and the pilot situated over the marking, all parts of the helicopter will be clear of any obstacle by a safe margin.

24.5.3 The centre of the touchdown marking shall be located at the centre of the FATO/TLOF area.

24.5.4 A touchdown marking shall be a yellow circle and have a line width of at least 1 m.

24.5.5 The inner diameter of the circle shall be half the D-value or 6 m, whichever is greater.

## 24.6 MAXIMUM ALLOWABLE MASS MARKING

24.6.1 A maximum allowable mass marking shall be provided at an elevated heliport.

24.6.2 A maximum allowable mass marking shall be located within FATO/TLOF and so arranged as to be readable from preferred final approach direction.

24.6.3 A maximum allowable mass marking shall consist of two digit numbers followed by a letter “t” to indicate the allowable mass in tonnes.

24.6.4 A numbers and the letter of the marking shall have a colour contrasting with the background and shall be in the form and proportion shown in Appendix G.

## 24.7 FATO/TLOF AREA DESIGNATION MARKING

24.7.1 A FATO/TLOF area designation marking shall be provided where it is necessary to designate the FATO area to the pilot. This marking aid identifies and distinguish one FATO from another.

24.7.2 A FATO/TLOF area designation marking shall be located at the beginning of the FATO/TLOF area.

24.7.3 A FATO/TLOF area designation marking shall consist of a runway designation and supplemented by an H.

## 24.8 HELIPORT NAME MARKING

24.8.1 A heliport name marking shall be provided at a heliport where visual identification of the heliport is necessary.

24.8.2 A heliport name marking shall be placed on the heliport so as to be visible, as far as practicable, at all angles above the horizontal.

24.8.3 A heliport name marking shall consist of the name or alphanumeric designator of the heliport as used in R/T communication.

24.8.4 The characters of the marking shall not be less than 3 m in height. The colour of the marking should contrast with the background.

24.8.5 A heliport name marking intended for use at night or during conditions of poor visibility shall be illuminated.

## 20. **LIGHTS**

25.1 The following lights shall be provided at heliport intended for use by night or in restricted visibility condition by day or night –

a. heliport beacon;

b. TLOF area lights; and

c. obstacle lights.

25.2 Under certain operational conditions, the following lights are required at heliport intended for use by night or in restricted visibility condition by day or night -

a. visual alignment guidance system; and

b. helicopter approach path indicator.

### 25.3 **HELIPORT BEACON**

25.3.1 A heliport beacon shall be provided at a heliport where –

a. long-range visual guidance is considered necessary and is not provided by other visual means;

b. identification of the heliport is difficult due to surrounding lights.

25.3.2 The heliport beacon shall be located on or adjacent to the heliport preferably at an elevated position and so that it does not dazzle the pilot at short range. Where a heliport beacon is likely to dazzle pilots at short range it may be switched off during the final stages pf the approach and landing.

25.3.3 The heliport beacon shall emit repeated series of equispaced short duration white flashes in the format shown in Appendix H.

25.3.4 The lights from the beacon shall show at all angles of azimuth.

25.3.5 To ensure that pilots are not dazzled during the final stages of the approach and landing, brilliancy control with 10 per cent and 3 per cent settings or shielding should be provided.

## 25.4 TLOF AREA LIGHTS

25.4.1 TLOF area lights shall be provided.

25.4.2 TLOF area lighting system shall consist of one or more of the following -

a. perimeter lights; and

b. floodlighting and/or arrays of segmented point source lighting [ASPSL] or luminescent panel [LP].

25.4.3 TLOF area perimeter lights shall be placed along the edge of the TLOF area or within a distance of 1.5 m from the edge.

25.4.4 Where the FATO/TLOF area is a circle, the perimeter lights shall be –

a. located on straight lines in a pattern which will provide information to pilot on drift displacement; and

b. where, the above is not practicable, evenly spaced around the perimeter of the FATO/TLOF at an appropriate interval.

25.4.5 TLOF area perimeter lights shall be spaced -

a. uniformly at intervals of not more than 3 m. with a minimum of four lights on each side including a light at each corner;

b. evenly, where lights are arranged in a circle, with a minimum of fourteen lights.

25.4.6 TLOF area perimeter lights shall installed such that the pattern cannot be seen by pilots from below the elevation of the FATO/TLOF area.

25.4.7 TLOF area perimeter lights shall be fixed omni-directional lights showing green.

25.4.8 TLOF area perimeter lights shall be inset.

25.4.9 ASPSL or LP lights, when provided to enhance surface texture cues, shall be placed around the touchdown marking. At these location, the ASPSL or LP should emit yellow. ASPSL or LP lights should not be placed adjacent to perimeter lights.

25.4.10 LP lights shall not extend above the surface by more than 2.5 cm.

25.4.11 LP lights shall have a minimum width of 6 cm.

25.4.12 TLOF floodlighting shall be located and adequately shielded so as to avoid glare to pilots in flight or to personnel working on the area. The arrangement and aiming of floodlights shall be such that shadows are kept to a minimum.

25.4.13 TLOF floodlighting shall be not more than 25 cm in height.

## 25.5 OBSTACLE LIGHTS

25.5.1 Specification on lighting of obstacles included in ASD 402, are equally applicable to heliports.

25.5.2 Obstacles shall be floodlighted if it is not possible to display lights on them.

## 25.6 VISUAL ALIGNMENT GUIDANCE SYSTEM

25.6.1 A visual alignment guidance system should be provided to serve non-instrument approaches to a heliport where one of the following conditions exists -

a. obstacle clearance, noise abatement or traffic control procedures require a particular direction to be flown; and

b. the environment of the heliport provides few visual surface cues.

25.6.2 A visual alignment guidance system shall be provided to serve instrument approaches to a heliport where one of the following conditions exists -

a. obstacle clearance, noise abatement or traffic control procedures require a particular direction to be flown;

b. the environment of the heliport provides few visual surface cues; and

c. it is physically impracticable to install an approach lighting system.

25.6.3 A visual alignment guidance system shall be located such that a helicopter is guided along the prescribed track towards the FATO/TLOF area, preferably at the downwind edge of the FATO/TLOF area.

25.6.4 The light unit shall be frangible and mounted as low as possible.

25.6.5 Where the lights of the system needs to be seen as discrete sources, light units shall be located such that at the extremes of system coverage the angle subtended between units as seen by the pilots shall not be less than 3 minutes of arc.

25.6.6 The angles subtended between light units of the system and other units comparable or greater intensities shall also not be less than 3 minutes of arc.

25.6.7 The signal format of the alignment guidance system shall include a minimum of three discrete signal sectors providing “offset to the right”, “on track” and “offset to the left” signals.

25.6.8 The signal format of the alignment guidance system shall be such that there is no possibility of confusion between the system and any associated visual approach slope indicator or other visual aids.

25.6.9 The system shall avoid the use of same coding as any associated visual approach slope indicator.

25.6.10 The signal format shall be such that the system is unique and conspicuous in all operational environments.

25.6.11 The useable coverage of the alignment guidance system shall equal to or better than that of the visual approach slope indicator system, with which it is associated.

25.6.12 A suitable intensity control shall be provided so as to allow adjustment to meet the prevailing conditions and to avoid dazzling the pilots during approach and landing.

25.6.13 An alignment guidance system shall be capable of adjustment in azimuth to within ± 5 minutes of arc of the desired approach path.

25.6.14 The angle of azimuth of alignment guidance system shall be such that during an approach a helicopter at the boundary of the "on track" signal will clear all objects in the approach area by a safe margin.

25.6.15 The characteristic of the obstacle protection surface is as follows –

| SURFACE AND DIMENSIONS | | NON-INSTRUMENT FATO | INSTRUMENT FATO |
|---|---|---|---|
| Length of inner edge | | Width of safety area | Width of safety area |
| Distance from end of FATO | | 3 m minimum | 60 m |
| Divergence | | 10% | 15% |
| Total length | | 2 500 m | 2 500 m |
| Slope | PAPI | 0.57º | 0.57º |
| | HAPI | 0.65º | 0.65º |
| | APAPI | 0.9º | 0.9º |

25.6.16 New objects or extension of existing objects shall not be permitted above the obstacle protection surface, except when, in the opinion of the authority, the new object or extension would be shielded by an existing immovable object.

25.6.17 Existing objects above an obstacle protection surface shall be removed, except when, in the opinion of the authority, the object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety of operations of helicopters.

25.6.18 In the event of the failure of any component affecting the signal format the system will automatically switched off.

25.6.19 The light units shall be so designed that deposits of condensation on optical transmitting or reflecting surface will interfere to the least possible extent with the light signal and will not cause spurious or false signals to be generated.

25.6.20 A flight inspection of a new installation shall be conducted to confirm the correct operation of the system.

25.6.21 A routine scheduled inspection shall be made to ensure the correct operation of the system.

## 25.7 HELICOPTER APPROACH PATH INDICATOR

25.7.1 A helicopter approach path indicator should be provided to serve non-instrument approaches to a heliport where one of the following conditions exists -

a. obstacle clearance, noise abatement or traffic control procedures require a particular direction to be flown;

b. the environment of the heliport provides few visual surface cues; and

c. the characteristic of the helicopter require a stabilized approach.

25.7.2 A HAPI shall be located such that a helicopter is guided to the desired position within the FATO/TLOF area, and aligned in azimuth with the preferred approach direction.

25.7.3 The light unit shall be frangible and mounted as low as possible.

25.7.4 The signal format of the HAPI shall include four discrete signal sectors providing an “above slope”, an “on slope”, a “slightly below” and a “below slope” signal.

25.7.5 The signal format of the HAPI shall be shown as in Appendix K.

25.7.6 The signal repetition rate of the flashing sector of the HAPI shall be at least 2 Hz.

25.7.7 The angular size of the “on slope” sector of the HAPI shall be 45 minutes.

25.7.8 The angular size of the “slightly below” sector of the HAPI shall be 15 minutes.

25.7.9 Colour transition of the HAPI in the vertical plane shall be such as appear to an observer at a distance of not less than 300 m to occur within a vertical range of not more than three minutes.

25.7.10 The transmission factor of a red or green filter shall not be less than 15 per cent at the maximum intensity.

25.7.11 A full intensity of the red light of the HAPI shall have a Y-coordinate not exceeding 0.320.

25.7.12 A full intensity of the green light of the HAPI shall be within the following boundaries -

| | |
|---|---|
| Yellow boundary | $y = 0.726 – 0.726x$ |
| White boundary | $x = 0.625y – 0.041$ |
| Blue boundary | $y = 0.390 – 0.171x$ |

25.7.13 A suitable intensity control shall be provided so as to allow adjustment to meet the prevailing conditions and to avoid dazzling the pilots during approach and landing

25.7.14 A HAPI system shall be capable of adjustment in elevation at any desired angle between 1 degree and 12 degrees above the horizontal with an accuracy of ± 5 minutes of arc.

25.7.15 The angle of azimuth of elevation setting of HAPI shall be such that during an approach a helicopter at the upper boundary of the “below slope” signal will clear all objects in the approach area by a safe margin.

25.7.16 In the event of vertical misalignment of a unit exceeds ± 0.5º, the will automatically switched off or if the flashing mechanism fail, no light will be emitted in the failed flashing sector(s).

25.7.17 The light units shall be so designed that deposits of condensation on optical transmitting or reflecting surface will interfere to the least possible extent with the light signal and will not cause spurious or false signals to be generated.

25.7.18 An obstacle protection surface shall be established when it is intended to provide HAPI or other visual approach slope indicator.

25.7.19 The characteristic of the obstacle protection surface is as follows –

| SURFACE AND DIMENSIONS | | NON-INSTRUMENT FATO | INSTRUMENT FATO |
|---|---|---|---|
| Length of inner edge | | Width of safety area | Width of safety area |
| Distance from end of FATO | | 3 m minimum | 60 m |
| Divergence | | 10% | 15% |
| Total length | | 2 500 m | 2 500 m |
| Slope | PAPI | 0.57º | 0.57º |
| | HAPI | 0.65º | 0.65º |
| | APAPI | 0.9º | 0.9º |

25.7.20 New objects or extension of existing objects shall not be permitted above the obstacle protection surface, except when, in the opinion of the authority, the new object or extension would be shielded by an existing immovable object.

25.7.21 Existing objects above an obstacle protection surface shall be removed, except when, in the opinion of the authority, the object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety of operations of helicopters.

25.7.22 When aeronautical study indicates that existing objects extending above obstacle protection surface could adversely affect the operations of helicopters, one or more of the following measures shall be taken -

a. suitably raise the approach slope of the system;

b. reduce the azimuth spread of the system so that the object is outside the confines of the beam;

c. displace the axis of the system and its associated obstacle protection surface by no more than 5º;

d. suitably displace the FATO/TLOF area; and

e. install a visual alignment guidance system.

# RESCUE AND FIRE FIGHTING

## 21. LEVEL OF PROTECTION

26.1 The level of protection to be provided for rescue and fire fighting shall be based on the over-all length of the longest helicopter normally using the heliport and in accordance with the heliport fire fighting category.

| Category | Helicopter over-all length * |
|---|---|
| H1 | up to but not including 15 m |
| H2 | from 15 m up to but not including 24 m |
| H3 | from 24 m up to but not including 35 m |

* Helicopter length including the tail boom and rotors

26.2 During anticipated periods of operations by smaller helicopters, the heliport fire fighting category may be reduced to that of the highest category of helicopter planned to use the heliport during that time.

## 22. EXTINGUISHING AGENTS

27.1 The principal extinguishing agent shall be a foam meeting the minimum performance level B.

27.2 The amounts of water for foam production and the complementary agents to be provided shall be in accordance with the heliport fire fighting category.

| Category | Foam meeting Performance level B | | Complementary agents | |
|---|---|---|---|---|
| | Water [L] | Discharge rate foam solution [L/min] | Dry chemical powders [kg] | or $CO_2$ |
| H1 | 2 500 | 250 | 45 | 90 |
| H2 | 5 000 | 500 | 45 | 90 |
| H3 | 8 000 | 800 | 45 | 90 |

27.3 The amounts of water specified do not have to be stored on or adjacent to the heliport of there is suitable adjacent pressurized water main system capable of sustaining the required discharge rate.

27.4 At least one hose spray line capable of delivering foam in a jet spray pattern at 250 L/min shall be provided.

27.5 Additionally at heliports in categories H2 and H3, at least two monitors shall be provided each having a capability of achieving the required discharge rate and position at different locations around the heliport so as to ensure the application of foam to any part of the heliport under any weather condition and to minimize the possibility of both monitors being impaired by a helicopter accident.

## 23. **RESPONSE TIME**

28.1 The rescue and fire fighting service should be immediately available on or in vicinity of the heliport while helicopter movements are taking place.

24. **RESCUE EQUIPMENT**

29.1 Rescue equipment commensurate with the level of helicopter operations shall be provided as follows -

| | Heliport HF category | |
|---|---|---|
| **Equipment** | **H1 and H2** | **H3** |
| Adjustable wrench | 1 | 1 |
| Axe, rescue, non-wedge or aircraft type | 1 | 1 |
| Cutters, bolt, 60 cm | 1 | 1 |
| Crowbar, 105 cm | 1 | 1 |
| Hook, grab or slaving | 1 | 1 |
| Hacksaw, heavy duty complete with 6 spare blades | 1 | 1 |
| Blanket, fire resistant | 1 | 1 |
| Ladder, length appropriate to Helicopter in use | - | 1 |
| Lifeline, 5 cm, 15 m in length | 1 | 1 |
| Pliers, side cutting | 1 | 1 |
| Set of assorted screwdrivers | 1 | 1 |
| Harness knife complete with sheath | 1 | 1 |
| Gloves, fire resistant | 2 pairs | 3 pairs |
| Power cutting tool | - | 1 |

29.2 Rescue equipment should be stored adjacent to the heliport.

25. **ESCAPE ROUTE**

30.1 At least two escape routes, adjacent to each other, shall be provided at elevated heliports.

## DEVIATIONS

26. The Department of Civil Aviation shall notify and publish deviations from any Standards and Recommended Practices contained in ICAO Annex 14 in the Aeronautical Information Services publications in compliance to the Article 38 of the Convention on International Civil Aviation.

27. The Appendices to this Directive shall be taken, construed, read and be part of this Directive.

**DATO' IR. KOK SOO CHON**
**Director General**
**Department of Civil Aviation**
**Malaysia**

**Dated: 22 September 2005**

# AMENDMENT RECORD

| Amendment Number | Amendment Date | Incorporated by | Incorporated on |
|---|---|---|---|
| 1/2006 | 4 Jan 2006 | Para 2 | 4 Jan 2006 |
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APPENDIX A

# PARTICULARS TO BE INCULDED IN AN AERODROME MANUAL

## PART I : GENERAL

General information, including the following –

a. name of heliport owner/operator, and address and telephone number[s] at which the owner/operator can be contacted at all times;

b. purpose and scope of the aerodrome manual;

c. the condition for use of the heliport, including operational limitation and restriction;

d. the system for recording aircraft movements; and

e. obligations of the heliport owner/operator.

## PART 2 : PARTICULARS OF THE HELIPORT SITE

General information, including the following –

a. a plan of the heliport showing the main heliport facilities, including visual aids and non-visual aids provided;

b. a plan showing the approach surfaces and take-off surfaces, and obstacles, within 1000 m radius of the heliport; and

c. a plan showing the position of the heliport in relation to other infrastructure and terrain within 5000 m radius of the heliport.

## PART 3 : PARTICULARS OF THE HELIPORT

### 3.1 GENERAL INFORMATION

a. the name of the heliport;

b. the type of the heliport;

c. the location of the heliport from the nearest town and nearest aerodrome;

d. the geographical coordinates of the heliport reference point [WGS-84];

e. the elevation of the heliport; and

f. details of heliport beacon [if provided].

### 3.2 HELIPORT DIMENSIONS

a. FATO/TLOF – type, dimension, slope, true bearing, designation number and bearing strength in tonnes;

b. safety area – type and dimension;

### 3.3 GEOGRAPHICAL COORDINATES

a. geometric centre of FATO/TLOF; and

b. significant obstacles in the approach and take-off paths, and the top elevation.

### 3.4 DECLARED DISTANCES

a. take-off distance available;

b. rejected take-off distance available; and

c. landing distance available.

### 3.5 VISUAL AIDS

a. visual aids viz. markings and lighting

b. wind direction indicator;

c. VAGS;

d. HAPI.

### 3.6 RESCUE AND FIRE FIGHTING

a. level of protection.

## PART 4 : HELIPORT OPERATIONS PROCEDURES

### 4.1 ATC COORDINATION PROCEDURES

Particulars of procedures for coordination with Air Traffic Services Unit[s], including –

a. procedures for arrivals;
b. procedures for departures; and
c. communication facilities provided.

## 4.2 HELIPORT REPORTING PROCEDURES

Particulars of procedures for notifying any changes to the infrastructure, facilities and operational procedures, including –

a. arrangement for reporting changes; and
b. recording of changes.

## 4.3 ACCESS TO HELIPORT AREA

Procedure for the preventing of the unauthorized entry of person[s] into the heliport area including facilities provided to prevent such occurrence.

## 4.4 HELIPORT EMERGENCY PLAN

Particulars of the heliport emergency plan, including the following –

a. plans for dealing with emergencies occurring at the heliport;
b. details of test for equipment to be used in emergencies, including frequency of those tests; and
c. details of exercise to test the emergency plan, including the frequency of those exercises.

## 4.5 RESCUE AND FIRE FIGHTING

Particulars of facilities, equipment, personnel and procedures for meeting the rescue and fire fighting requirements.

## 4.6 INSPECTION OF HELIPORT

Particulars of procedures for the inspection of the heliport area and obstacle limitation surfaces, including –

a. details of inspection intervals and times;
b. inspection checklist and logbook; and
c. reporting of inspection findings and correction of unsafe conditions.

## 4.7 VISUAL AIDS AND ELECTRICAL SYSTEMS

Particulars of procedures for the inspection and maintenance, aeronautical lights [including obstacle lights], signs, markers and electrical systems –

a. arrangements for inspection;
b. reporting and recording of inspection findings;
c. correction of deficiencies;
d. arrangements for routine maintenance; and
e. arrangements secondary power supply.

## 4.8 MAINTENANCE OF HELIPORT AREA

Particulars of procedures for the inspection and maintenance of heliport area –

a. arrangements for inspection;
b. maintenance of paved areas;
c. maintenance of markings; and
d. maintenance of drainage.

## 4.9 HELIPORT SAFETY MANAGEMENT

Particulars of procedures to ensure safety during heliport operations -

a. helicopter arrival procedures [including engine shut-down];
b. helicopter departing procedure [including engine-start];
c. fuelling procedures and safety precautions;
d. protection from rotor downwash;
e. apron sweeping and cleaning;
f. arrangements for reporting incidents and accidents; and
g. personnel safety procedures.

## 4.10 OBSTACLE CONTROL

Particulars setting out the procedures for -

a. controlling obstacles within the authority of owner;
b. monitoring development within the obstacle limitation surfaces; and
c. coordination for controlling new developments in vicinity of the heliport.

## 4.11 REMOVAL OF DISABLED AIRCRAFT

Particulars of the procedures for removing of a disabled aircraft, including -

a. role of heliport owner and holder of the aircraft certificate of registration;
b. arrangements for notifying holder of the aircraft certificate of registration; and
c. arrangements for obtaining equipment and personnel to remove aircraft.

## 4.12 HANDLING OF HAZARDOUS MATERIALS

Particulars of the procedures for safe handling and storage of hazardous materials, including -

a. arrangements for special areas on the heliport for storage of inflammable liquids [including aviation fuel] and other hazardous material; and
b. method for the delivery, storage, dispensing and handling of hazardous material.

## 4.13 PROTECTION OF NAVAIDS

Particulars of the procedures for the protection of sites for radio navigational aids –

a. arrangements for controlling activities in vicinity of navaids installations;
b. arrangements for ground maintenance of these installations; and
c. arrangements for the installation of signs warning of radiation.

## PART 5 : HELIPORT ADMINISTRATION

Particulars of the heliport administration, including –

a. the heliport organizational chart showing the name and position of key personnel;

b. the duty-list and responsibilities of key personnel, in particular the Heliport Manager and Heliport Duty Officer; and

c. the name and telephone number of the Heliport Manager.

APPENDIX B

# DIMENSION AND SLOPES
# OBSTACLE LIMITATION SURFACES

## NON-INSTRUMENT AND NON PRECISION FATO

| | Non-instrument [visual] FATO | | | Non-Precision [instrument approach] FATO |
|---|---|---|---|---|
| | Helicopter performance class | | | |
| Surface and dimension | 1 | 2 | 3 | |
| **APPROACH** | | | | |
| Width of inner edge | Width of safety area boundary | | | Width of safety area boundary |
| Location of inner edge | | | | |
| **First section** | | | | |
| Divergence : day / night | 10% / 15% | 10% / 15% | 10% / 15% | 16% |
| Length : day / night | 245 m ❶ / 245 m ❶ | 245 m ❶ / 245 m ❶ | 245 m ❶ / 245 m ❶ | 2 500 m |
| Outer width : day / night | 49 m ❷ / 73.5 m ❷ | 49 m ❷ / 73.5 m ❷ | 49 m ❷ / 73.5 m ❷ | 890 m |
| Slope [maximum] | 8% ❶ | 8% ❶ | 8% ❶ | 3.33 % |
| **Second section** | | | | |
| Divergence : day / night | 10% / 15% | 10% / 15% | 10% / 15% | - |
| Length : day / night | ❸ | ❸ | ❸ | - |
| Outer width : day / night | ❹ | ❹ | ❹ | - |
| Slope [maximum] | 12.5% | 12.5% | 12.5% | - |
| **Third section** | | | | |
| Divergence | parallel | parallel | parallel | |
| Length : day / night | ❺ | ❺ | ❺ | - |
| Outer width : day / night | ❹ | ❹ | ❹ | - |
| Slope [maximum] | 15% | 15% | 15% | - |
| | | | | - |
| **INNER HORIZONTAL** | | | | |
| Height | - | - | - | 45 m |
| Radius | - | - | - | 2 000 m |
| **CONICAL** | | | | |
| Slope | - | - | - | 5% |
| Height | - | - | - | 55 m |
| **TRANSITIONAL** | | | | |
| Slope | - | - | - | 20% |
| Height | - | - | - | 45 m |

❶ Slope and length enables helicopters to decelerate for landing while observing “avoid” areas
❷ The width of the inner edge shall be added to this dimension
❸ Determined by the distance from the inner edge to the point where the divergence produces a width of 7 rotor diameters for day operations and 10 rotor diameters for night operations
❹ Seven rotor diameters for day operations and 10 rotor diameters for night operations
❺ Determined by the distance from the inner edge to where the approach surface reaches a height of 150 m above the elevation of the inner edge

APPENDIX C

# DIMENSION AND SLOPES
# OBSTACLE LIMITATION SURFACES

## PRECISION APPROACH FATO

| | 3° approach | | | | 6° approach | | | |
|---|---|---|---|---|---|---|---|---|
| | Height above FATO | | | | Height above FATO | | | |
| Surface and dimension | 90 m [300 ft] | 60 m [200 ft] | 45 m [150 ft] | 30 m [100 ft] | 90 m [300 ft] | 60 m [200 ft] | 45 m [150 ft] | 30 m [100 ft] |
| **APPROACH** | | | | | | | | |
| Length of inner edge | 90 m | 90 m | 90 m | 90 m | 90 m | 90 m | 90 m | 90 m |
| Distance from end of FATO | 60 m | 60 m | 60 m | 60 m | 60 m | 60 m | 60 m | 60 m |
| Divergence each side to height above FATO | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% |
| Distance to height above FATO | 1 745 m | 1 163 m | 872 m | 581 m | 870 m | 580 m | 435 m | 290 m |
| Width at height avbove FATO | 962 m | 671 m | 562 m | 380 m | 521 m | 380 m | 307.5 m | 235 m |
| Divergence to parallel section | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% |
| Width of parallel section | 2 793 m | 3 763 m | 4 246 m | 4 733 m | 4 250 m | 4 733 m | 4 975 m | 5 217 m |
| Distance to outer edge | 1 800 m | 1 800 m | 1 800 m | 1 800 m | 1 800 m | 1 800 m | 1 800 m | 1 800 m |
| Width at outer edge | 5 462 m | 5 074 m | 4 882 m | 4 686 m | 3 380 m | 3 187 m | 3 090 m | 2 993 m |
| Width at outer edge | 1 800 m | 1 800 m | 1 800 m | 1 800 m | 1 800 m | 1 800 m | 1 800 m | 1 800 m |
| Slope of first section | 2.5% | 2.5% | 2.5% | 2.5% | 5% | 5% | 5% | 5% |
| Length of first section | 3 000 m | 3 000 m | 3 000 m | 3 000 m | 1 500 m | 1 500 m | 1 500 m | 1 500 m |
| Slope of second section | 3% | 3% | 3% | 3% | 6% | 6% | 6% | 6% |
| Length of second section | 2 500 m | 2 500 m | 2 500 m | 2 500 m | 1 250 m | 1 250 m | 1 250 m | 1 250 m |
| Total length of surface | 10 000 m | 10 000 m | 10 000 m | 10 000 m | 8 500 m | 8 500 m | 8 500 m | 8 500 m |
| **CONICAL** | | | | | | | | |
| Slope | 5% | 5% | 5% | 5% | 5% | 5% | 5% | 5% |
| Height | 55 m | 55 m | 55 m | 55 m | 55 m | 55 m | 55 m | 55 m |
| **TRANSITIONAL** | | | | | | | | |
| Slope | 14.3% | 14.3% | 14.3% | 14.3% | 14.3% | 14.3% | 14.3% | 14.3% |
| Height | 45 m | 45 m | 45 m | 45 m | 45 m | 45 m | 45 m | 45 m |

APPENDIX D

# DIMENSION AND SLOPES
# OBSTACLE LIMITATION SURFACES

## STRAIGHT TAKE-OFF

| | Non-instrument [visual] | | | Instrument |
|---|---|---|---|---|
| | Helicopter performance class | | | |
| Surface and dimension | 1 | 2 | 3 | |
| **TAKE-OFF CLIMB** | | | | |
| Width of inner edge | | Width of safety area | | 90 m |
| Location of inner edge | | Boundary or end of clearway | | Boundary or end of clearway |
| **First section** | | | | |
| Divergence : day / night | 10% / 15% | 10% / 15% | 10% / 15% | 30% |
| Length : day / night | ❶ | 245 m ❷ / 245 m ❷ | 245 m ❷ / 245 m ❷ | 2 850 m |
| Outer width : day / night | ❸ | 49 m ❹ / 73.5 m ❹ | 49 m ❹ / 73.5 m ❹ | 1 800 m |
| Slope [maximum] | 4.5% * | 8% ❷ | 8% ❷ | 3.5 % |
| **Second section** | | | | |
| Divergence : day / night | parallel | 10% / 15% | 10% / 15% | parallel |
| Length : day / night | ❺ | ❶ | ❶ | 1 510 m |
| Outer width : day / night | ❸ | ❸ | ❸ | 1 800 m |
| Slope [maximum] | 4.5% | 15% | 15% | 3.5% * |
| **Third section** | | | | |
| Divergence | - | parallel | parallel | parallel |
| Length : day / night | - | ❺ | ❺ | 7 640 m |
| Outer width : day / night | - | ❸ | ❸ | 1 800 m |
| Slope [maximum] | - | 15% | 15% | 2% |

❶ Determined by the distance from the inner edge to the point where the divergence produces a width of 7 rotor diameters for day operations and 10 rotor diameters for night operations
❷ Slope and length enables helicopters to decelerate for landing while observing “avoid” areas The width of the inner edge shall be added to this dimension
❸ Seven rotor diameters for day operations and 10 rotor diameters for night operations
❹ The width of the inner edge shall be added to this dimension
❺ Determined by the distance from the inner edge to where the approach surface reaches a height of 150 m above the elevation of the inner edge

* This slope exceeds the maximum mass one-engine-inoperative climb gradient of many helicopters which are currently operating.

APPENDIX E

# CRITERIA FOR CURVED TAKE-OFF CLIMB / APPROACH AREA

## NON-INSTRUMENT FINAL APPROACH AND TAKE-OFF

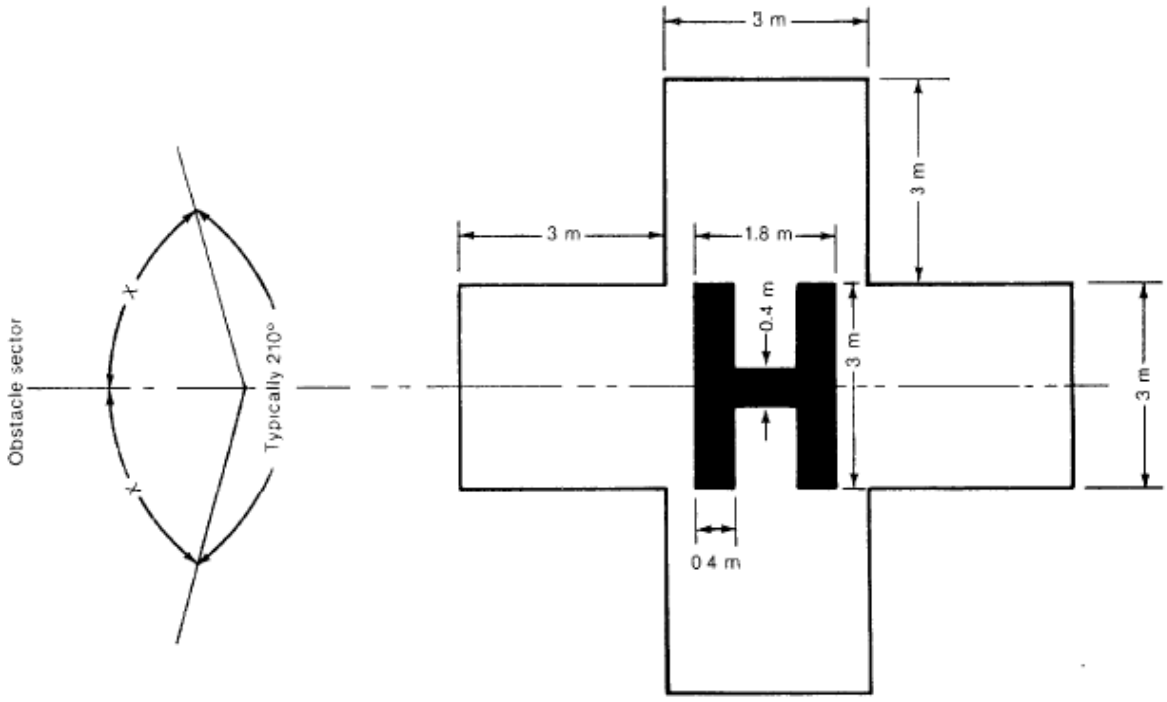
| Facility | Requirement |
|---|---|
| Directional change | As required [120° max.] |
| Radius of turn on centreline | Not less than 270 m. |
| Sistance to inner gate * | (a) For performance class 1 helicopters – not less than 305 m from end of safety area or helicopter clearway.<br>(b) For performance class 2 and 3 helicopters – not less than 370 m from end of FATO. |
| Width of inner gate | For day use<br>Width of inner edge plus 20% of distance to inner gate.<br>For night use<br>Width of inner edge plus 30% of distance to inner gate. |
| Width of outer gate | For day use<br>Width of inner edge plus 20% of distance to inner gate out to minimum width of 7 rotor diameters.<br>For night use<br>Width of inner edge plus 30% of distance to inner gate out to minimum width of 10 rotor diameters. |
| Elevation of inner and outer gates | Determined by the distance from the inner edge and the designated gradient[s]. |
| Slope | As in Appendix A, B or C. |
| Divergence | As in Appendix A, B or C. |
| Total length of area | As in Appendix A, B or C. |

* This is the minimum distance required prior to initiating a turn after take-off or completing a turn in the final phase

Note : More than one turn may be necessary in the total length of the take-off climb / approach area. The same criteria will apply for each subsequent turn except that the widths of the inner and outer gates would normally be the maximum width of the area.

APPENDIX F

# HELIPORT IDENTIFICATION MARKING
[shown with hospital cross]

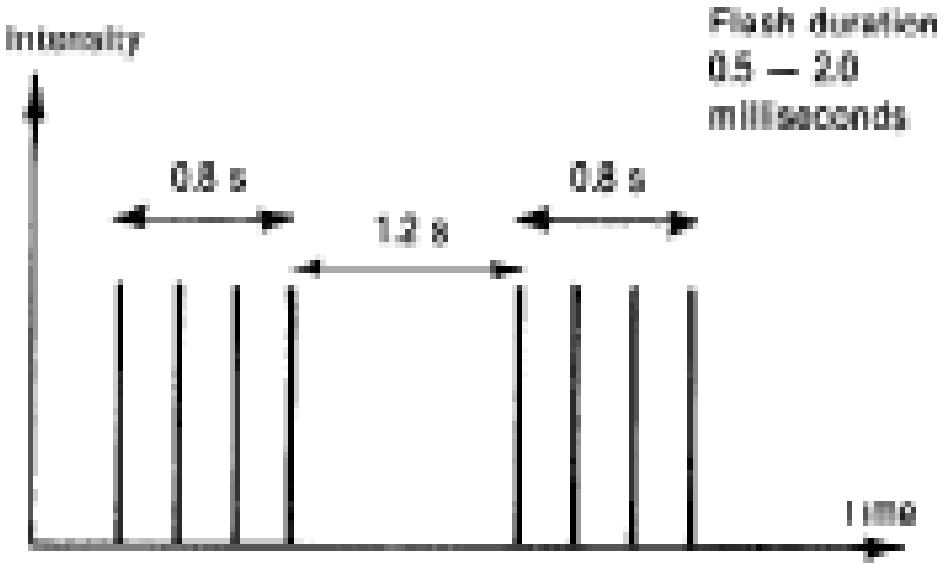


APPENDIX G

# MAXIMUM ALLOWABLE MASS MARKING

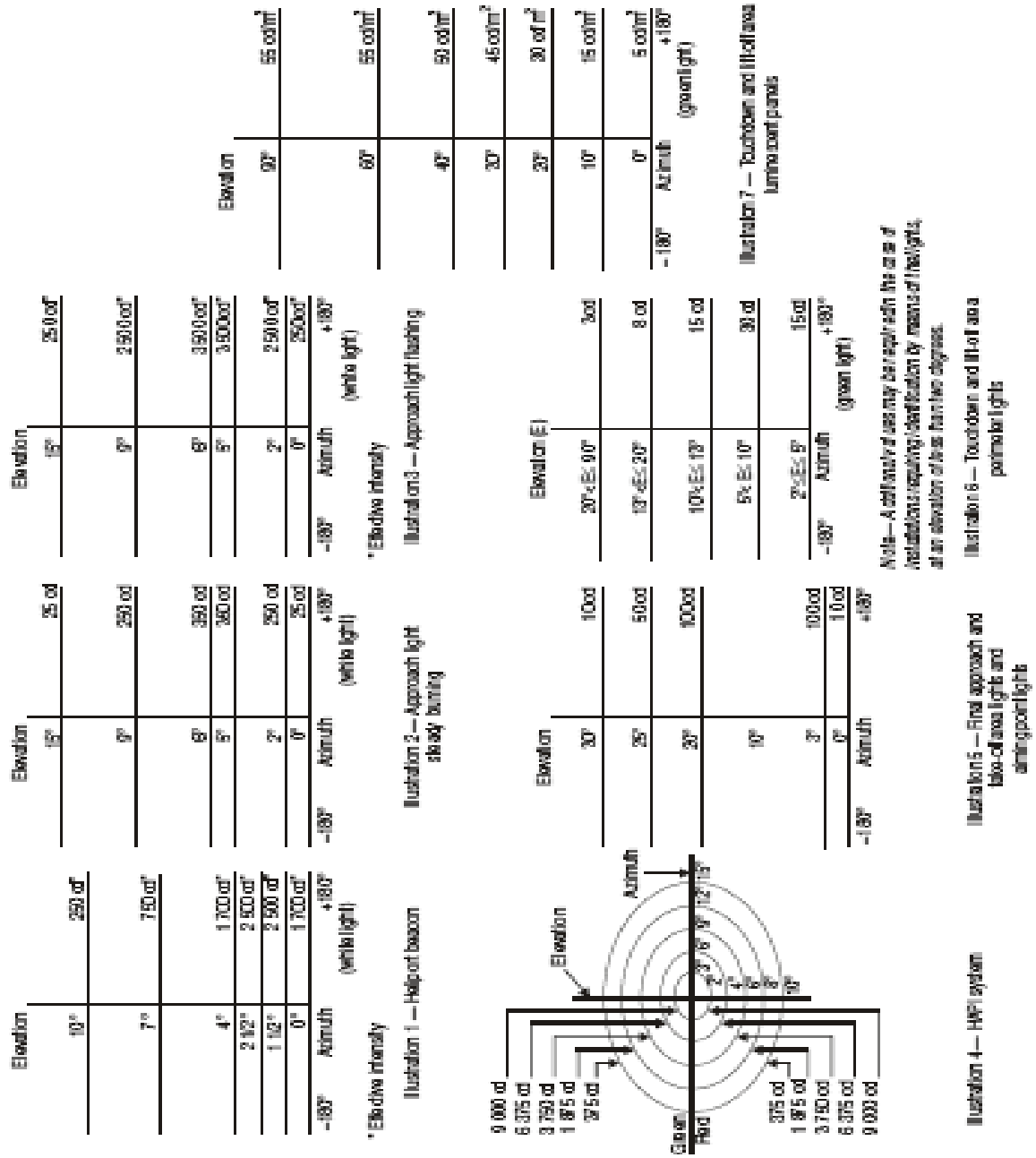
APPENDIX H

# HELIPORT BEACON FLASH CHARACTERISTICS



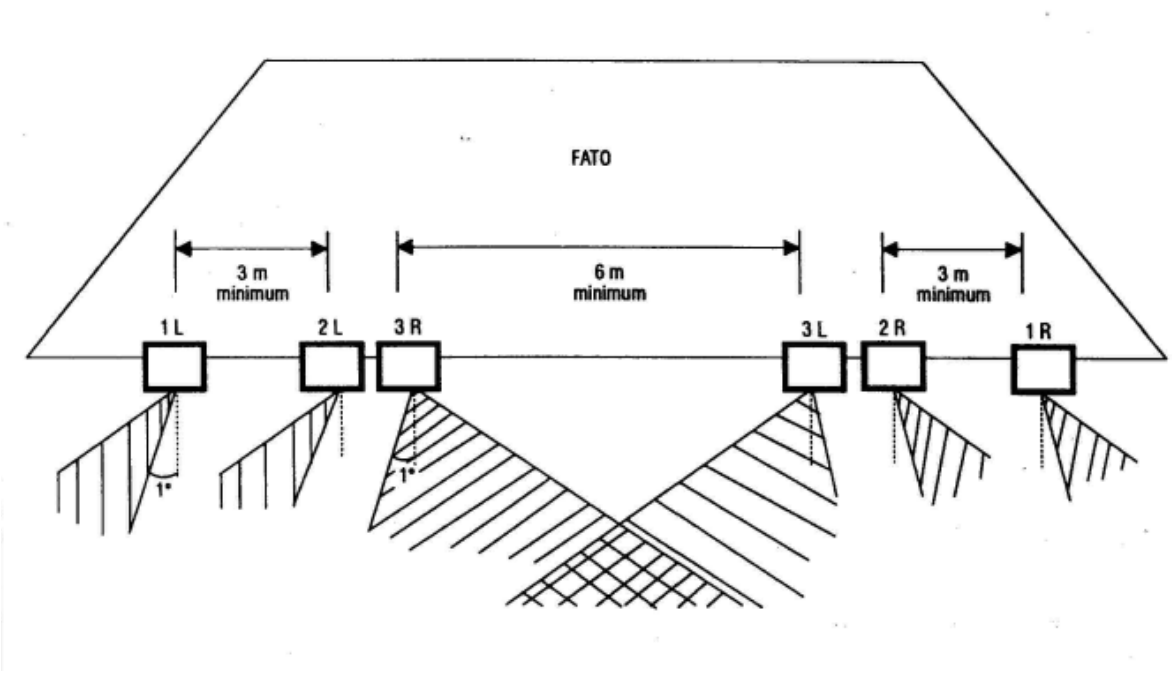
APPENDIX I

# ISOCANDELA DIAGRAMS OF LIGHTS FOR HELIPORTS



APPENDIX J

# VISUAL ALIGNMENT GUIDANCE SYSTEM



APPENDIX K

# HELICOPTER APPROACH PATH INDICATOR

| Sector | Format |
|---|---|
| Above | Flashing green |
| On slope | Green |
| Slightly below | Red |
| Below | Flashing red |

Illustration A

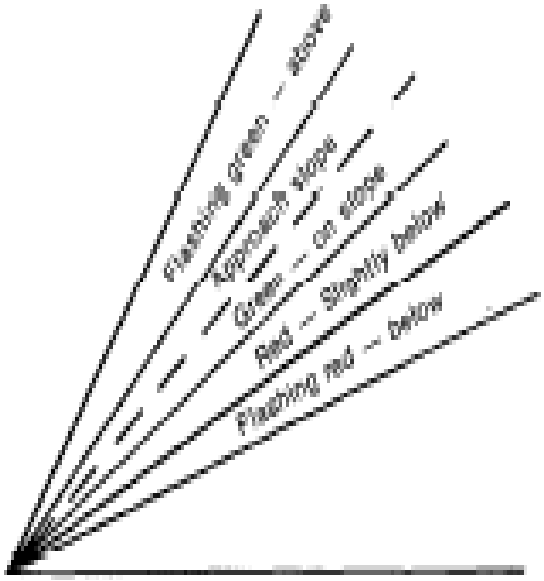



Illustration B