Kingdom of Saudi Arabia
General Authority of Civil Aviation

GACA REGULATION

Section 14
Aerodromes

Volume II – Heliports

Edition 4.0

FOREWORD

The following Regulations governing Heliports - Volume II - Heliports are based on Articles 1, 2, 3, 4, 5, and Chapter 3 – Titled Aerodromes and Air Navigation Facilities Articles -33 thru 48 of the Civil Aviation Act that has been approved by the Council of Ministers Resolution No. 185 dated 17/07/1426H and issued by the Royal Decree No. M/44 dated 18/07/1426H. (23/08/2005G), and are in accordance with ICAO Annex 14 - Volume II - Heliports Second Edition with Amendment 4 and its related documents.

The promulgation of this regulation is based on the authority granted in Article 179 of the Civil Aviation Act, and is issued under the authority of the President, General Authority of Civil Aviation, as a duly delegated representative of the GACA Board of Directors, in accordance with Order No.T-41, dated 30/12/1429H (28/12/2008G).

The General Authority of Civil Aviation is responsible for the preparation and distribution of all regulations in sufficient quantities so that all service providers and aircraft operators based in the Kingdom of Saudi Arabia are able to obtain an authentic copy prior to the effective date of the Regulation.

APPROVED:

Original Signed by

Fahad Ben Abdulla Al Saud
President, General Authority of Civil Aviation,

Effective Date: 13 November, 2014

CONTENT RULES

1) Introduction:

a) This Section contains regulations that contain the specifications prescribed for the physical characteristics and obstacle limitation surfaces at Heliports as well as certain facilities and technical services normally provided in conjunction with Heliports. These specifications are not intended to limit or regulate the operation of aircraft.

b) To a great extent, the specifications for individual facilities detailed in the General Authority of Civil Aviation Regulation (GACAR) Section 14 Volume II- Heliports, have been interrelated by a reference code system described in this chapter and by the designation of the heliport types that are to be provided, as described in the definitions. This simplifies the reading of Volume II of this Section, but in most cases, results in efficiently proportioned aerodromes when the specifications are followed.

c) This document sets forth the minimum Heliports specifications to accommodate aircraft that are currently operating or for aircraft that are known to be planned for future introduction. Accordingly, any more demanding safeguards for as yet unknown or unplanned aircraft have not been considered. Decisions regarding such matters are left to Airport Standards and Safety (AS&S) of the Safety Department (SD) of the Safety and Air Transport Sector (S&AT) of GACA to consider regarding each individual aerodrome.

d) Guidance on the possible effects of future aircraft on these specifications is given in the ICAO Aerodrome Design Manual (Doc 9157), Part 2.

e) GACAR Section 14 - Volume II Heliports,–, does not include specifications relating to the overall planning of aerodromes (such as separation between adjacent aerodromes or capacity of individual aerodromes); impact on the environment, or of economic and other non-technical factors that should be considered in the development of an aerodrome. Information on these subjects is included in the ICAO Airport Planning Manual (Doc 9184), Part 1. Guidance material on the environmental aspects of the development and operation of an aerodrome is included in the ICAO Airport Planning Manual, Part 2. Aviation security is an integral part of aerodrome planning and operations. GACAR Section 14, Volume I, contains several specifications aimed at enhancing the level of security at aerodromes. Specifications on other facilities related to security are given in ICAO Annex 17 and detailed guidance on the subject is contained in the ICAO Security Manual.

f) The interpretation of some of the specifications in the Section expressly requires the exercising of discretion, the taking of a decision or the performance of a function by the appropriate authority. In other specifications, the expression appropriate authority does not actually appear although its inclusion is implied. In both cases, the responsibility for whatever determination or action is necessary shall rest with the State having jurisdiction over the heliport

g) The specifications in Section 14, Volume II shall apply to all heliports intended to be used by helicopters in international civil aviation. The specifications of Section 14, Volume I shall apply, where appropriate, to other heliports as well

2) Organization Structure:

GACA has established an Airport Standards and Safety Division (AS&S) within the Safety Department (SD) of the Safety and Air Transport Sector (S&AT) to carry out the function of safety regulation of aerodrome to ensure and enforce compliance with the applicable specifications of GACAR Section 14 Volume II Heliports, and to provide safety oversight of aerodromes to include audits, inspection, investigation and data analysis. In order to assure safety and the continued validity of the aerodrome certificate, GACA - SD inspectors are required to perform an onsite aerodrome inspection on an annual basis at a minimum or on a more frequent basis if directed by higher authority.

a) The GACA - SD shall certify Heliports used for international operations in accordance with the specifications contained in this Section as well as other relevant GACA/ICAO specifications.

b) The GACA - SD should certify Heliports open to public use in accordance with specifications contained in this Section as well as other relevant GACA/ICAO specifications.

c) The framework for the certification of Heliports is given in the GACA Aerodromes Certification Manual and ICAO Manual on Certification of Aerodromes. (Doc 9774).

d) As part of the certification process, the GACA - SD shall ensure that a Heliport is developed a Heliport Manual which includes all pertinent information on the Heliports site, facilities, services, equipment, operating procedures, organization and management including a safety management system. The manual is to be submitted by the aerodrome for approval/acceptance prior to granting the aerodrome certificate. It is the responsibility of the certified aerodrome to keep the aerodrome manual revised and up to date.

3) Applicability:

The interpretation of some of the specifications in GACAR Section 14 Volume II expressly requires the exercise of discretion, decision making or the performance of a function by the appropriate authority. In other specifications, the named appropriate authority does not actually appear although its inclusion is implied. In both cases, the responsibility for whatever determination or action is necessary shall rest with the Airport Standards and Safety (AS&S) of the Safety Department (SD) of the Safety and Air Transport Sector (S&AT) which have regulatory and safety oversight jurisdiction over the Heliports.

SAUDI ARABIA has no heliports intended to be used by helicopters in international civil aviation.

GACA Regulation of this Section and AERODROME CERTIFICATION MANUAL prescribe rules governing the certification and operation of aerodromes and rules for operators of aircraft using aerodromes.

No person shall operate an aerodrome serving any helicopters having a certified (as designated by GACA) seating capacity that is engaged in regular air transport operations except under the authority of, and in accordance with the provisions of, an aerodrome operating certificate issued for that aerodrome under GACAR Section 14 Volume II.

Remark*:* An aerodrome operator who is not required to hold an aerodrome operating certificate may apply for an aerodrome operating certificate.

Except for a person operating a helicopter on an external load operation, no person operating a helicopter shall use any place within a populous area as a heliport unless the heliport has physical characteristics, obstacle limitation surfaces and visual aids commensurate with the characteristics of the helicopter being operated and the ambient light conditions during operations, and the heliport is clear of all persons, animals, vehicles or other obstructions during the hover, touchdown or lift-off other than persons and vehicles essential to the operation, and the selected approach and take-off paths are such that, if the helicopter is not a performance Class 1 helicopter, an autorotative landing can be conducted without any undue risk to any person on the ground, and the helicopter can be maneuvered in the aerodrome traffic circuit clear of any obstructions, and not in conflict with the aerodrome traffic circuit or instrument approach of any other aerodrome .

4) Rules of Constructions:

a) To avoid any misunderstanding within this regulation, certain words are to be interpreted as having specific meanings when they are used, unless the context requires otherwise:

(1) Words importing the singular include the plural;
(2) Words importing the plural include the singular; and
(3) Words importing the masculine gender include the feminine

b) In this regulation, the following protocol is used:

(1) The words **"Shall"** and **"must"** indicate that compliance is compulsory.
(2) The word **"should"** indicates a recommendation. It does not means that compliance is optional but rather that, where insurmountable difficulties exist, the GACA- S&AT may accept an alternative means of compliance, provided that an acceptable safety assurance from the Aerodrome shows that the safety requirements will not be reduced below that intended by the requirement.
(3) The word "**Can**" or **"May"** is used in a permissive sense to state authority or permission to do the act prescribed, and the words "no person may * * *" or "a person may not * * *" mean that no person is required, authorized, or permitted to do the act prescribed;
(4) The word **"will"** is used to express the future; and
(5) The word **"Includes"** means **"includes but is not limited to".**

5) Safety management:

a) The GACA - SD shall establish a safety program in order to achieve an acceptable level of safety in aerodrome operations.

b) The GACA - SD shall establish the acceptable level(s) of safety to be achieved by utilizing the Guidance on safety program and on defining acceptable levels of safety that is contained in the ICAO Safety Management Manual (SMM) (Doc 9859).

c) The GACA - SD shall require, as part of its safety program, that a certified aerodrome operator implements a safety management system acceptable to the GACA that, as a minimum:

(1) identifies safety hazards;
(2) ensures that remedial action necessary to maintain an acceptable level of safety is implemented;
(3) provides for continuous monitoring and regular assessment of the safety level achieved; and

d) ensures that remedial action necessary to maintain an acceptable level of safety is implemented;

6) Reference code:

Note — The intent of the reference code is to provide a simple method for interrelating the numerous specifications concerning the characteristics of aerodromes so as to provide a series of aerodrome facilities that are suitable for the helicopters that are intended to operate at the aerodrome The code is not intended to be used for determining runway length or pavement strength requirements. The code is composed of two elements which are related to the helicopters performance characteristics and dimensions. Element 1 is a number based on the helicopters reference field length and element 2 is a letter based on the helicopters wing span and outer main gear wheel span. A particular specification is related to the more appropriate of the two elements of the code or to an appropriate combination of the two code elements. The code letter or number within an element selected for design purposes is related to the critical helicopters characteristics for which the facility is provided. When applying GACAR Section 14, Volume II, the helicopter which the aerodrome is intended to serve are first identified and then the two elements of the code;

a) A Heliports reference code — code number and letter — which is selected for aerodrome planning purposes shall be determined in accordance with the characteristics of the helicopters for which an aerodrome facility is intended.

b) The Heliports reference code numbers and letters shall have the meanings assigned to them in Table 1-1.

c) The code number for element 1 shall be determined from Table 1-1, column 1, selecting the code number corresponding to the highest value of the helicopters reference field lengths of the helicopters for which the runway is intended.

Note. — Comprehensive guidance material concerning WGS-84 is contained in the World Geodetic System — 1984 (WGS-84) Manual (Doc 9674).

Note. — The determination of the helicopter reference field length is solely for the selection of a code number and is not intended to influence the actual runway length provided.

d) The code letter for element 2 shall be determined from Table 1-1, column 3, by selecting the code letter which corresponds to the greatest wing span, or the greatest outer main gear wheel span, whichever gives the more demanding code letter of the helicopters for which the facility is intended.

Note. — Guidance to assist the appropriate authority in determining the Heliports reference code is given in the ICAO Aerodrome Design Manual (Doc 9157), Parts 1 and 2.

e) Vertical reference system Mean sea level (MSL) datum, which gives the relationship of gravity-related height (elevation) to a surface known as the geoid, shall be used as the vertical reference system.

Note 1.— The geoid globally most closely approximates MSL. It is defined as the equipotential surface in the gravity field of the Earth which coincides with the undisturbed MSL extended continuously through the continents.

Note 2.— Gravity-related heights (elevations) are also referred to as orthometric heights while distances of points above the ellipsoid are referred to as ellipsoidal heights.

f) Temporal reference system, the Gregorian calendar and Coordinated Universal Time (UTC) shall be used as the temporal reference system. When a different temporal reference system is used, this shall be indicated in GEN 2.1.2 of the Aeronautical Information Publication (AIP), as published.

7) MANUALS:

The following ICAO manuals and documents related to the specifications of this Section;
Heliport Manual (Doc 9261-AN/903)
Design Manual (Doc 9157)
Part 1 — Runways
Part 2 — Taxiways, Aprons and Holding Bays
Part 3 — Pavements
Part 4 — Visual Aids
Part 5 — Electrical Systems
Part 6 — Frangibility
Aeronautical Information Services Manual (Doc 8126)
Airport Planning Manual (Doc 9184)
Part 1 — Master Planning
Part 2 — Land Use and Environmental Control
Part 3 — Guidelines for Consultant/Construction Services
Airport Services Manual (Doc 9137)
Part 1 — Rescue and Fire Fighting
Part 2 — Pavement Surface Conditions
Part 3 — Bird Control and Reduction
Part 5 — Removal of Disabled Aircraft
Part 6 — Control of Obstacles
Part 7 — Airport Emergency Planning
Part 8 — Airport Operational Services
Part 9 — Airport Maintenance Practices
Air Traffic Services Planning Manual (Doc 9426)
Airworthiness Manual (Doc 9760)
Volume I — Organization and Procedures
Volume II — Design Certification and Continuing Airworthiness

AMENDMENT PROCEDURE

The existing General Authority of Civil Aviation Regulations (GACAR) will be periodically reviewed to reflect the latest updates of International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs); it will be also amended to reflect the latest aviation safety provisions issued by GACA and other regional and international Civil Aviation organizations. A complete revised edition incorporating all amendments will be published every three years from the original effective date of this regulation. The amendment procedure shall be as follows;

1. When the General Authority of Civil Aviation (GACA) receives an amendment to any of the current ICAO Annexes that can affect the provisions of this regulation, it will be forwarded by the Vice President of International Organization Affairs to the Assistant Vice President, Safety and Air Transport (S&AT) who in turn will forward it to Aviation Regulation Department to coordinate with the concerned department to study and comments, taking into account the ICAO deadline for the reply.

2. When any GACA department or stakeholder proposes an amendment to this regulation, it will send a letter with the proposed amendment including a clear justification and argument for such amendment. Following the receipt of an amendment proposal, the S&AT will analyze this proposal and forward its comments and any proposed decision action to the S&AT Vice President.

3. An accepted amendment proposal will be prepared as draft amendment to the GACAR-Section 14 and forwarded to the originator of the amendment proposal and concerned GACA department (s) for further review and comment within a specified timeline.

4. All accepted amendments will be drafted in the form of Notices of Proposed Amendments (NPA) and forwarded to all concerned parties including stakeholders for comment within a two-month reply period. The NPA shall indicate the proposed Amendment's effective date.

5. Following the receipt of NPA replies, the S&AT will analyze the comments received and produce a new draft in consultation with the concerned GACA department. The final draft will be submitted to President of the General Authority of Civil Aviation for formal approval prior to publication.

6. The Amendment's effective date will take into account the comments of all the concerned parties and stakeholders.

7. Any differences between the GACAR Section 14 new amendment and ICAO Annexes Standards and Recommended Practices will be forwarded to ICAO as a Difference and published as it is in the Aeronautical Information Publication (AIP).

8. All concerned parties and stakeholders will be provided a copy of the new amendment and will be requested to update their copy of the GACAR Section 14 accordingly.

9. It is the responsibility of all concerned parties to keep their copy of GACAR-Section 14 and other GACA regulation publication up to date.

AMENDMENT RECORD

This edition incorporates all ICAO amendments to annex 14 - volume II, up to and including amendment 6

Amendment Number	Amendment Date	Incorporated by	Incorporated on
Edition 1.0	**June 2006**	**ASSD**	**Feb. 2009**
Edition 2.0	**April. 2012**	**ASSD**	**Nov. 2012**
Edition 3.0	**April. 2013**	**ASSD**	**Nov. 2013**
Edition 4.0	**13 November 2014**	**ASSD**	**13 November 2014**

SUPPLEMENTARY REGULATION

From time to time it will be necessary to issue regulation which supplement or augment the GACA Regulation. The following procedures will apply:

1 Supplementary regulation will be issued in the GACA Regulation Circular (RC).

1. The GACA Regulation Circular will be approved by the President.

2. The process for preparation and publishing of GACA Regulation Circular will be addressed in the GACA Quality System Manual.

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LIST OF CURRENT DEFFIRENCES TO ICAO SARPS

GACA Regulation Section 14 Vol II is based on ICAO Annex 14 Vol II. The ICAO Standards and Recommended Practices (SARPS). Where differences exist they have been notified to ICAO and are also published in the KSA Aeronautical Information Publication (AIP-GEN 1.7).

ICAO ANNEX 14 Vol. II Heliports		
SARP Identifier	**Regulation Reference**	**Difference**
No Differences		

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CHAPTER 1 – DEFINITIONS

General

Introductory Note. Section 14, Volume II of contains specifications that prescribe the physical characteristics and obstacle limitation surfaces to be provided for at heliports, and certain facilities and technical services normally provided at a heliport. It is not intended that these specifications limit or regulate the operation of an aircraft.

When designing a heliport, the critical design helicopter, having the largest set of dimensions and the greatest maximum take-off mass (MTOM) the heliport is intended to serve, would need to be considered.

It is to be noted that provisions for helicopter flight operations are contained in Annex 6, Part III.

1.1 Definitions

When the following terms are used in this volume they have the meanings given below. Section 14, Volume I contains definitions for those terms which are used in both volumes.

Accuracy:
A degree of conformance between the estimated or measured value and the true value.

Note. — For measured positional data the accuracy is normally expressed in terms of a distance from a stated position within which there is a defined confidence of the true position falling.

Calendar:
Discrete temporal reference system that provides the basis for defining temporal position to a resolution of one day (ISO 19108*).

Cyclic redundancy check (CRC):
A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss or alteration of data.

D. The largest overall dimension of the helicopter when rotor(s) are turning measured from the most forward position of the main rotor tip path plane to the most rearward position of the tail rotor tip path plane or helicopter structure.

Note.— "D" is sometimes referred to in the text using the terminology "D-value".

Data quality:
A degree or level of confidence that the data provided meets the requirements of the data user in terms of accuracy, resolution and integrity.

Datum:
Any quantity or set of quantities that may serve as a reference or basis for the calculation of other quantities (ISO 19104*).

Declared distances — heliports:

a) Take-off distance available (TODAH). The length of the final approach and take-off area plus the length of helicopter clearway (if provided) declared available and suitable for helicopters to complete the take-off.

b) Rejected take-off distance available (RTODAH). The length of the final approach and take-off area declared available and suitable for performance class 1 to complete a rejected take-off.

c) Landing distance available (LDAH). The length of the final approach and take-off area plus any additional area declared available and suitable for helicopters to complete the landing manoeuvre from a defined height.

Dynamic load bearing surface:
A surface capable of supporting the loads generated by a helicopter conducting an emergency touch down on it.

Elevated heliport:
A heliport located on a raised structure on land.

Ellipsoid height (Geodetic height):
The height related to the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question.

FATO/TLOF. Specific case where a FATO and a TLOF occupy the same space on an elevated heliport, a helideck or a shipboard heliport.

Final approach and take-off area (FATO):
A defined area over which the final phase of the approach manoeuvre to hover or landing is completed and from which the take-off manoeuvre is commenced. Where the FATO is to be used by helicopters operated in performance class 1, the defined area includes the rejected take-off area available.

Geodetic datum:
A minimum set of parameters required to define location and orientation of the local reference system with respect to the global reference system/frame.

Geoid:
The equipotential surface in the gravity field of the Earth which coincides with the undisturbed mean sea level (MSL) extended continuously through the continents.

Note.— The geoid is irregular in shape because of local gravitational disturbances (wind tides, salinity, current, etc.) and the direction of gravity is perpendicular to the geoid at every point.

Geoid undulation:
The distance of the geoid above (positive) or below (negative) the mathematical reference ellipsoid.

Note.— In respect to the World Geodetic System — 1984 (WGS-84) defined ellipsoid, the difference between the WGS- 84 ellipsoidal height and orthometric height represents WGS-84 geoid undulation.

Helicopter air taxiway:
A defined path on the surface established for the air taxiing of helicopters.

Helicopter clearway:
A defined area on the ground or water , selected and/ or prepared as a suitable area over which a helicopter operated in performance class 1 may accelerate and achieve a specific height.

Helicopter ground taxiway:
A ground taxiway intended for the ground movement of wheeled undercarriage helicopters.

Helicopter stand:
An aircraft stand which provides for parking a helicopter and, where air taxiing operations are contemplated, the helicopter touchdown and lift-off.

Helicopter taxi-route. A defined path established for the movement of helicopters from one part of a heliport to another. A taxi-route includes a helicopter air or ground taxiway which is centred on the taxi-route.

Helideck:
A heliport located on a fixed or floating off-shore facility such as an exploration and/or production unit used for the exploitation of oil or gas.

Heliport:
An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters.

Heliport elevation. The elevation of the highest point of the FATO expressed as the distance above mean sea level.

Integrity (aeronautical data):
A degree of assurance that an aeronautical data and its value has not been lost nor altered since the data origination or authorized amendment.

Integrity classification (aeronautical data). Classification based upon the potential risk resulting from the use of corrupted data. Aeronautical data is classified as:

a. Routine data: there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.
b. Essential data: there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and
c. Critical data: there is a high probability when using corrupted critical data that the continued safe fight and landing of an aircraft would be severely at risk with the potential for catastrophe.

Obstacle:
All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that:

a) are located on an area intended for the surface movement of aircraft; or that

b) extend above a defined surface intended to protect aircraft in flight**;** or

c) stand outside those defined surfaces and that have been assessed as being a hazard to air navigation**.**

Orthometric height:
Height of a point related to the geoid, generally presented as an MSL elevation.

Point-in-space approach (PinS). The Point-in-space approach is based on GNSS or SBAS and is an approach procedure designed for helicopters only. It is aligned with a reference point located to permit subsequent flight manoeuvring or approach and landing using visual manoeuvring in adequate visual conditions to see and avoid obstacles.

Point-in-space (PinS) visual segment. This is the segment of a helicopter PinS approach procedure from the MAPt to the landing location for a PinS ―proceed visually‖ procedure. The visual segment connects the Point-in-space (PinS) to the landing location.

Note. — *The procedure design criteria for a PinS approach and the detailed design requirements for a visual segment are established in PANS-OPS (Doc 8168).*

Protection area:
An area within a taxi-route and around a helicopter stand which provides separation from objects, the FATO, other taxi-routes and helicopter stands, for safe manoeuvring of helicopters.

Rejected take-off area:
A defined area on a heliport suitable for helicopters operating in performance class 1 to complete a rejected take-off.

Runway-type FATO. A FATO having characteristics similar in shape to a runway.

Shipboard heliport:
A heliport located on a ship that may be purpose or non-purpose built. A purpose built shipboard heliport is one designed specifically for helicopter operations. A non-purpose built shipboard heliport is one that utilizes an area of the ship that is capable of supporting a helicopter but not designed specifically for that task**.**

Static load-bearing surface:
A surface capable of supporting the mass of a helicopter situated upon it.

Safety area:
A defined area on a heliport surrounding the FATO which is free of obstacles, other than those required for air navigation purposes, and intended to reduce the risk of damage to helicopters accidentally diverging from the FATO.

Station declination:
An alignment variation between the zero degree radial of a VOR and true north, determined at the time the VOR station is calibrated.

Surface level heliport:
A heliport located on the ground or on a structure on the surface of the water.

Touchdown and lift-off area (TLOF):
An area on which a helicopter may touchdown or lifts off.

Winching area:
An area provided for the transfer by helicopter of personnel or stores to or from a ship.

1.2 Abbreviations and symbol

Abbreviations

AIP	Aeronautical Information Publication
ASPSL	Arrays of segmented point source lighting
cd	Candelas
cm	Centimeter
FATO	Final approach and take-off area
ft	foot
GNSS	Global navigation satellite system
GACA	General Authority of Civil Aviation
GACAR	GACA Regulation
HAPI	Helicopter approach path indicator
HFM	Helicopter flight manual
Hz	Hertz
ICAO	International Civil Aviation Organization
kg	Kilogram
km/h	Kilometre per hour
KSA	Kingdom of Saudi Arabia
kt	Knot
L	Litre
lb	Pounds
LDAH	Landing distance available
L/min	Litre per minute
LOA	Limited obstacle area
LOS	Limited obstacle sector
LP	Luminescent panel
m	Metre
MAPt	Missed approach point
MTOM	Maximum take-off mass
OFS	Obstacle free sector
PinS	Point-in-space
S&AT	Safety and Air Transport Sector
SARPs	Standards and Recommended Practices
R/T	Radio Telephony or radio communications
RTODAH	Rejected take-off distance available
s	Second
SBAS	Satellite-based augmentation system
t	Metric tonne (1000 kg)
TLOF	Touchdown and lift-off area
TODAH	Take-off distance available
UCW	Undercarriage width
VSS	Visual segment surface

Symbols

°	Degree
=	Equals
%	Percentage
±	Plus or minus

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CHAPTER 2 – HELIPORT DATA

2.1 Aeronautical data

2.1.1 Determination and reporting of heliport related aeronautical data shall be in accordance with the accuracy and integrity requirements set forth in Tables 1 to 5 contained in Appendix 1 while taking into account the established quality system procedures. Accuracy requirements for aeronautical data are based upon a 95 per cent confidence level and in that respect, three types of positional data shall be identified: surveyed points (e.g. FATO threshold), calculated points (mathematical calculations from the known surveyed points of points in space, fixes) and declared points (e.g. flight information region boundary points).

Note. — Specifications governing the quality system are given in Annex 15, Chapter 3.

2.1.2 Contracting States shall ensure that integrity of aeronautical data is maintained throughout the data process from survey/origin to the next intended user. Based on the applicable integrity classification, the validation and verification procedures shall:

a. For routine data: avoid corruption throughout the processing of the data
b. For essential data: assure corruption does not occur at any stage of the entire process and may include additional processes as needed to address potential risks in the overall system architecture to further assure data integrity at this level; and
c. For critical data: assure corruption does not occur at any stage of the entire process and include additional integrity assurance procedures to fully mitigate the effects of faults identifies by thorough analysis of the overall system architecture as potential data integrity risks.

Note. — Guidance material in respect to the processing of aeronautical data and aeronautical information is contained in RTCA document DO-200B and European Organization for Civil Aviation Equipement (EUROCAE) Document ED-76B – Standard for Prcessing Aeronautical Data.

2.1.3 Protection of electronic aeronautical data while stored or in transit shall be totally monitored by the cyclic redundancy check (CRC). To achieve protection of the integrity level of critical and essential aeronautical data as classified in 2.1.2 above, a 32 or 24 bit CRC algorithm shall apply respectively.

2.1.4 To achieve protection of the integrity level of routine aeronautical data as classified in 2.1.2 above, a 16 bit CRC algorithm should apply.

Note.— Guidance material on the aeronautical data quality requirements (accuracy, resolution, integrity, protection and traceability) is contained in the World Geodetic System — 1984 (WGS-84) Manual (Doc 9674). Supporting material in respect of the provisions of Appendix 1 related to accuracy and integrity of aeronautical data, is contained in RTCA Document DO-201A and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-77, entitled “Industry Requirements for Aeronautical Information”.

2.1.5 Geographical coordinates indicating latitude and longitude shall be determined and reported to the aeronautical information services authority in terms of the World Geodetic System — 1984 (WGS-84) geodetic reference datum, identifying those geographical coordinates which have been transformed into WGS-84 coordinates by mathematical means and whose accuracy of original field work does not meet the requirements in Appendix 1, Table 1.

2.1.6 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 in tables
contained in Appendix 1.

2.1.7 In addition to the elevation (referenced to mean sea level) of the specific surveyed ground positions at heliports, geoid undulation (referenced to the WGS-84 ellipsoid) for those positions as indicated in Appendix 1, shall be determined and reported to the aeronautical information services authority.

Note 1. — An appropriate reference frame is that which enables WGS-84 to be realized on a given heliport and with respect to which all coordinate data are related.

Note 2. — Specifications governing the publication of WGS- 84 coordinates are given in Annex 4, Chapter 2 and Annex 15, Chapter 3.

2.2 Heliport reference point

2.2.1 A heliport reference point shall be established for a heliport or a landing location not collocated with an aerodrome.

Note.— When the heliport or landing location is collocated with an aerodrome, the established aerodrome reference point serves both aerodrome and heliport or landing location.

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

2.2.3 The position of the heliport reference point shall be measured and reported to the aeronautical information services authority in degrees, minutes and seconds.

2.3 Heliport elevations

2.3.1 The heliport elevation and geoid undulation at the heliport elevation position shall be measured and reported to the aeronautical information services authority to the accuracy of one-half metre or foot.

2.3.2 The elevation of the touchdown and lift-off area and/or the elevation and geoid undulation of each threshold of the final approach and take-off area (where appropriate) shall be measured and reported to the aeronautical information services authority to the accuracy of one half meter foot:

Note.— Geoid undulation must be measured in accordance with the appropriate system of coordinates.

2.4 Heliport dimensions and related information

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

a) heliport type — surface-level, elevated, shipboard or helideck;

b) touchdown and lift-off area — dimensions to the nearest metre or foot, slope, surface type, bearing strength in tonnes (1 000 kg);

c) FATO— type of FATO, true bearing to one-hundredth of a degree, designation number (where appropriate), length, and width to the nearest metre or foot, slope, surface type;

d) safety area — length, width and surface type;

e) helicopter ground taxiway and helicopter and air taxiway — designation, width, surface type;

f) apron — surface type, helicopter stands;

g) clearway — length, ground profile; and

h) visual aids for approach procedures, marking and lighting of FATO, TLOF, helicopter ground taxiways and helicopter air taxiways and helicopter stands.

2.4.2 The geographical coordinates of the geometric centre of the touchdown and lift-off area and/or of each threshold of the final approach and take-off area (where appropriate) shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and hundredths of seconds.

2.4.3 The geographical coordinates of appropriate centre line points of helicopter ground taxiways and hekicopter air taxiways shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and hundredths of seconds.

2.4.4 The geographical coordinates of each helicopter stand shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and hundredths of seconds.

2.4.5 The geographical coordinates of significant obstacles on and in the vicinity of a heliport shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and tenths of seconds. In addition, the top elevation rounded up to the nearest metre or foot, type, marking and lighting (if any) of the significant obstacles shall be reported to the aeronautical information services authority.

2.5 Declared distances

The following distances to the nearest metre or foot shall be declared, where relevant, for a heliport:

a) take-off distance available;

b) rejected take-off distance available; and

c) landing distance available.

2.6 Co-ordination between aeronautical information services and heliport authorities

2.6.1 To ensure that aeronautical information services units obtain information to enable them to provide up-to-date pre-flight information and to meet the need for in-flight information, arrangements shall be made between aeronautical information services and heliport authorities responsible for heliport services to report to the responsible aeronautical information services unit, with a minimum of delay:

a) information on heliport conditions;

b) the operational status of associated facilities, services and navigation aids within their area of responsibility;

c) any other information considered to be of operational significance.

2.6.2 Before introducing changes to the air navigation system, due account shall be taken by the services responsible for such changes of the time needed by the aeronautical information service for the preparation, production and issue of relevant material for promulgation. To ensure timely provision of the information to the aeronautical information service, close co-ordination between those services concerned is therefore required.

2.6.3 Of a particular importance are changes to aeronautical information that affect charts and/or computer based navigation systems which qualify to be notified by the aeronautical information regulation and control (AIRAC) system, as specified in Annex 15, Chapter 6 and Appendix 4. The predetermined, internationally agreed AIRAC effective dates in addition to 14 days postage time shall be observed by the responsible heliport services when submitting the raw information/data to aeronautical information services.

2.6.4 The heliport services responsible for the provision of raw aeronautical information/data to the aeronautical information services shall do that while taking into account accuracy and integrity requirements for aeronautical data as specified in Appendix 1 to this Section.

Note 1. — Specifications for the issue of a NOTAM and SNOWTAM are contained in Annex 15, Chapter 5, Appendices 6 and 2 respectively.

Note 2. — The AIRAC information is distributed by the AIS at least 42 days in advance of the AIRAC effective dates with the objective of reaching recipients at least 28 days in advance of the effective date.

Note 3. — The schedule of the predetermined internationally agreed AIRAC common effective dates at intervals of 28 days, including 6 November 1997 and guidance for the AIRAC use are contained in the Aeronautical Information Services Manual (Doc 8126, Chapter 3, 3.1.1 and Chapter 4, 4.4).

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CHAPTER 3 – PHYSICAL CHARACTERISTICS

3.1 Surface-level heliports

Note 1.— The provisions given in this section are based on the design assumption that no more than one helicopter will be in the FATO at the same time.

Note 2.— The design provisions given in this section assume when conducting operations to a FATO in proximity to another FATO, these operations will not be simultaneous. If simultaneous helicopter operations are required, appropriate separation distances between FATOs need to be determined, giving due regard to such issues as rotor downwash and airspace, and ensuring the flight paths for each FATO, defined in Chapter 4, do not overlap.

Note 3.— The specifications for ground taxi-routes and air taxi-routes are intended for the safety of simultaneous operations during the manoeuvring of helicopters. However, the wind velocity induced by the rotor downwash might have to be considered.

Final approach and take-off areas

3.1.1 A surface-level heliport shall be provided with at least one final approach and take-off area (FATO)

Note. — A FATO may be located on or near a runway strip or taxiways strip.

3.1.2 A FATO shall be obstacle free

3.1.3 The dimensions of a FATO shall be:

a) where intended to be used by helicopters operated in performance class 1, as prescribed in the helicopter flight manual (HFM) except that, in the absence of width specifications, the width shall be not less than the greatest overall dimension (D) of the largest helicopter the FATO is intended to serve;

b) where intended to be used by helicopters operated in performance class 2 or 3, of sufficient size and shape to contain an area within which can be drawn a circle of diameter not less than:

i) 1D of the largest helicopter when the maximum take-off mass (MTOM) of helicopters the FATO is intended to serve is more than 3175 kg,

ii) 0.83 D of the largest helicopter when the MTOM of helicopters the FATO is intended to serve is 3175 kg or less.

Note.— The term FATO is not used in the helicopter flight manual (HFM). The minimum landing/takeoff area specified in the HFM for the appropriate performance class 1 flight profile is necessary to determine the size of the FATO. However,, for vertical take-off procedures in performance class 1, the requirement rejected take-off area is not normally quoted in the HFM and it will be necessary to obtain information which includes complete containment – this figure will always be greater than 1D.

3.1.4 Where intended to be used by helicopters operated in performance class 2 or 3 with MTOM of 3175 kg or less, the FATO should be sufficient size and shape to contain an area within which can be drawn a circle of diameter not less than 1D.

Note. — Local conditions, such as elevation and temperature, may need to be considered when determining the size of FATO. Guidance is given in the Heliport Manual (Doc 9261)

3.1.5 The FATO shall provide rapid drainage but the mean slope in any direction shall not exceed 3 per cent. No portion of a FATO shall have a local slope exceeding:

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

b. 7 per cent where the heliport is intended to be used by helicopters operated in performance class 2 or 3

3.1. 6 The surface of the FATO shall:

a) be resistant to the effects of rotor downwash;

b) be free of irregularities that would adversely affect the take-off or landing of helicopters; and

c) have bearing strength sufficient to accommodate a rejected take-off by performance class 1 helicopters operated in performance class 1.

3.1.7 The surface of a FATO surrounding a TLOF intended for use by helicopters operated in performance classes 2 and 3, shall be static load bearing.

3.1.8 The FATO should provide ground effect.

3.1.9 The FATO should be located so as to minimize the influence of the surrounding environment, including turbulence, which could have an adverse impact on helicopter operations.

Note. — Guidance on determining the influence of turbulence is given in the Heliport Manual (Doc 9161). If turbulence mitigating design measures are warranted but not practical, operational limitations may need to be considered under certain wind conditions.

Helicopter clearways

Note. — A helicopter clearway would need to be considered when the heliport is intended to be used by helicopters operating in performance class 1. See Heliport Manual (Doc 9261).

3.1.10 When a helicopter clearway is provided, it shall be located beyond the end of the FATO.

3.1.11 The width of a helicopter clearway should not be less than that of the associated safety area. (See Figure 3-1)

3.1.12 The ground in a helicopter clearway should not project above a plane having an upward slope of 3 per cent, the lower limit of this plane being a horizontal line which is located on the periphery of the FATO.

3.1.13 An object situated in a helicopter clearway which may endanger helicopters in the air, should be regarded as an obstacle and should be removed.

Touchdown and lift-off areas

3.1.14 At least one touchdown and lift-off area (TLOF) shall be provided at a heliport.

3.1.15 One TLOF shall be located within the FATO or one or more TLOFs shall be collocated with helicopter stands. For runway-type FATOs, additional TLOFs located in the FATO are acceptable. For further guidance see *Heliport Manual* (Doc 9261).

3.1.16 The (TLOF) shall be of sufficient size to contain a circle of diameter of at least 0.83D of the largest helicopter the area is intended to serve.

Note. — TLOF may be any shape.

3.1.17 Slopes on a TLOF area shall be sufficient to prevent accumulation of water on the surface of the area, but shall not exceed 2 per cent in any direction

3.1.18 Where the TLOF is within the FATO, the TLOF shall be dynamic load bearing.

3.1.19 Where TLOF is collocated with a helicopter stand, the TLOF shall be static load bearing and be withstanding the traffic of helicopters that the area is intended to serve.

3.1.20 Where a TLOF is located within a FATO which can contain a circle of diameter more than 1 D, the centre of the TLOF shall be located not less than 0.5 D from the edge of the FATO.

Safety area

3.1.21 A FATO shall be surrounded by a safety area which need not be solid.

3.1.22 A safety area surrounding a FATO shall extend outwards from the periphery of the FATO for a distance of at least 3 m or 0.25 D whichever is greater, of the largest helicopter the area is intended to serve:

a) each external side of the safety area shall be at least 2 D where the FATO is quadrilateral; or

b) the outer diameter of the safety area shall be at least 2 D where the FATO is circular

(See Figure 3-1.)

3.1.23 There shall be a protected side slope rising at 45° from the edge of the safety area to a distance of 10 meters, whose surface shall not be penetrated by obstacles; except that when obstacles are located to one side of the FATO only, they may be permitted to penetrate the side slope surface.

Note.— When only a single approach and take-off climb surface is provided, the need for specific protected side slopes would be addressed in the aeronautical study required in 4.2.7.

3.1.24 No fixed raised object shall be permitted above the plane of the FATO 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.

3.1.25 Objects whose function requires them to be located on the safety area shall not:

a) if located at a distance of less than 0.75 D from the centre of the FATO, penetrate a plane at a height of 5 cm above the plane of the FATO; and

b) if located at a distance of 0.75 D or more from the centre of the FATO, penetrate a plane originating at a height of 25 cm above the plane of the FATO and sloping upwards and outwards at a gradient of 5 per cent.

3.1 .26 The surface of the safety area, when solid, shall not exceed an upward slope of 4 per cent outwards from the edge of the FATO.

3.1.27 Where applicable, the surface of the safety area shall be treated to prevent flying debris caused by rotor downwash.

3.1.28 When solid, the surface of the safety area abutting the FATO shall be continuous with the FATO and be capable of supporting, without structural damage, the helicopters that the heliport is intended to serve.

Helicopter ground taxiway and helicopter ground taxi-routes

Note 1.— A helicopter ground taxiway is intended to permit the surface movement of a wheeled helicopter under its own power

Note 2.— When a taxiway is intended for use by aeroplanes and helicopters, the provisions for taxiways for aeroplanes and helicopter ground taxiways will be taken into consideration and the more stringent requirements will be applied.

3.1.29 The width of a helicopter ground taxiway shall not be less than: 1.5 times the largest width of the

undercarriage (UCW) of helicopters the ground taxiway is intended to serve (see Figure 3-2).

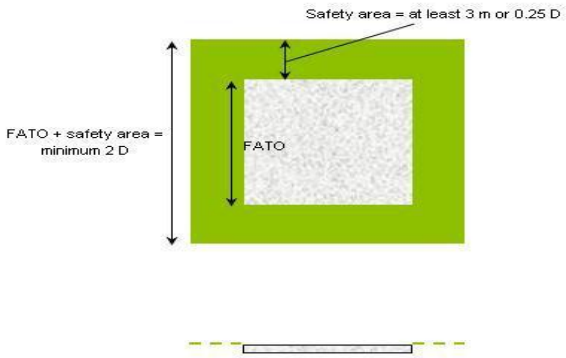

Figure 3-1. FATO and associated safety area

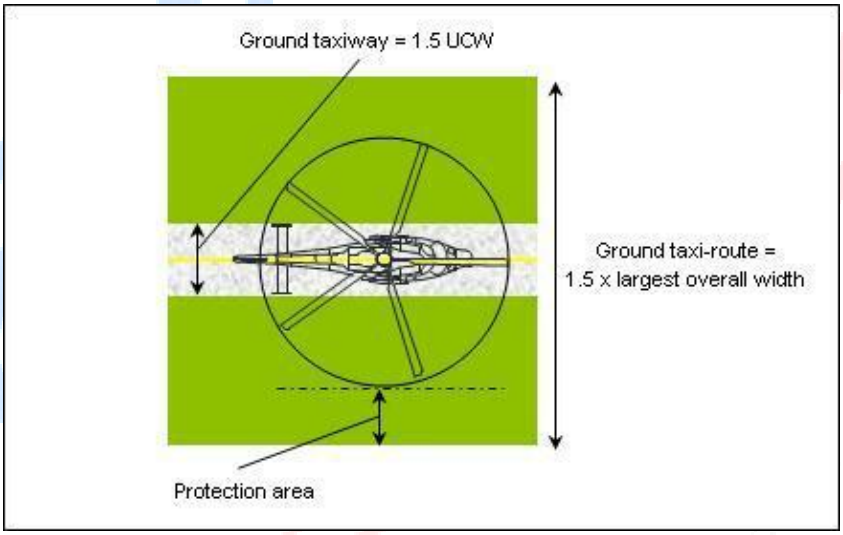

Figure 3-2. Helicopter ground taxi-route/taxiway

3.1.30 The longitudinal slope of a helicopter ground taxiway shall not exceed 3 per cent.

3.1.31 A helicopter ground taxiway shall be static load bearing and be capable of withstanding the traffic of helicopters that the helicopter ground taxiway is intended to serve.

3.1.32 A helicopter ground taxiway shall be centered in a ground taxi-route.

3.1.33 A helicopter ground taxi-route shall extend symmetrically on each side of the centerline for at least 0.75 times the largest overall width of the helicopters that it is intended to serve.

Note.— The part of the helicopter ground taxi-route that extends symmetrically on each side of the centre line from 0.5 times the largest overall width of the helicopters it is intended to serve to the outermost limit of the helicopter ground taxi-route is its protection area.

3.1.34 No fixed raised object shall be permitted above the surface of the ground on a helicopter ground taxi-route, except for frangible objects, which, because of their function, must be located thereon. No mobile object shall be permitted on a ground taxi-route during

helicopter movements.

3.1.35 Objects whose function requires them to be located on a helicopter ground taxi-route shall not:

a) be located at a distance of less than 50 cm from the edge of the helicopter ground taxiway; and

b) penetrate a plane originating at a height of 25 cm above the plane of the taxiway, at a distance of 50 cm from the edge of the taxiway and sloping upwards and outwards at a gradient of 5 per cent.

3.1.36 The helicopter ground taxiway and the helicopter ground taxi-route shall provide rapid drainage but the helicopter ground taxiway transverse slope shall not exceed 2 per cent.

3.1.37 The surface of a helicopter taxi-route shall be resistant to the effect of rotor downwash.

3.1.38 For simultaneous operations, the helicopter ground taxi-routes shall not overlap.

Helicopter air taxiways and helicopter air taxi-routes

Note.— An helicopter air taxiway is intended to permit the movement of a helicopter above the surface at a height normally associated with ground effect and at groundspeed less than 37km/h (20 kt).

3.1.39 The width of a helicopter air taxiway shall be at least two times the largest width of the undercarriage (UCW) of the helicopters of the helicopters that the air taxiway is intended to serve (see Figure 3-3).

3.1.40 The surface of a helicopter air taxiway should be static load bearing.

3.1.41 The slopes of the surface of a helicopter an air taxiway should not exceed the slope landing limitations of the helicopters the air taxiway is intended to serve. In any event the transverse slope should not exceed10 per cent and the longitudinal slope should not exceed 7 per cent.

3.1.42 A helicopter air taxiway shall be centered in an air taxi-route.

3.1.43 A helicopter air taxi-route shall extend symmetrically on each side of the centerline for a distance at least equal to the largest overall width of the helicopters that it is intended to serve.

Note.— The part of the helicopter air taxi-route that extends symmetrically on each side of the centre line from 0.5 times the largest overall width of the helicopters it is intended to serve to the outermost limit of the helicopter air taxi-route is its protection area.

3.1.44 No fixed raised object shall be permitted above the surface of the ground on an air taxi-route, except for frangible objects, which, because of their function, must be located thereon. No mobile object shall be permitted on an air taxi-route during helicopter movements.

3.1.45 Objects whose function requires them to be located on an air taxi-route shall not:

a) be located at a distance of less than 1 m from the edge of the air taxiway; and

b) penetrate a plane originating at a height of 25 cm above the plane of the taxiway, at a distance of 1 m from the edge of the taxiway and sloping upwards and outwards at a gradient of 5 per cent.

3.1.46 Objects above ground level whose function requires them to be located on an air taxi-route should not:

a) be located at a distance of less than 0.5 of the largest overall width of the helicopter for which the air taxi-route is designed from the centre line of the air taxiway; and

b) penetrate a plane originating at a height of 25 cm above the plane of the taxiway, at a distance of 0.5 of the largest overall width of the helicopter for which the air taxi-route is designed from the centre line of the taxiway, and sloping upwards and outwards at a gradient of 5 per cent.

3.1.47 The surface of helicopter air taxi-route shall be resistant to the effect of rotor downwash.

3.1.48 The surface of helicopter air taxi-route shall provide ground effect

3.1.49 For simultaneous operations, the helicopter air taxi-routes shall not overlap.

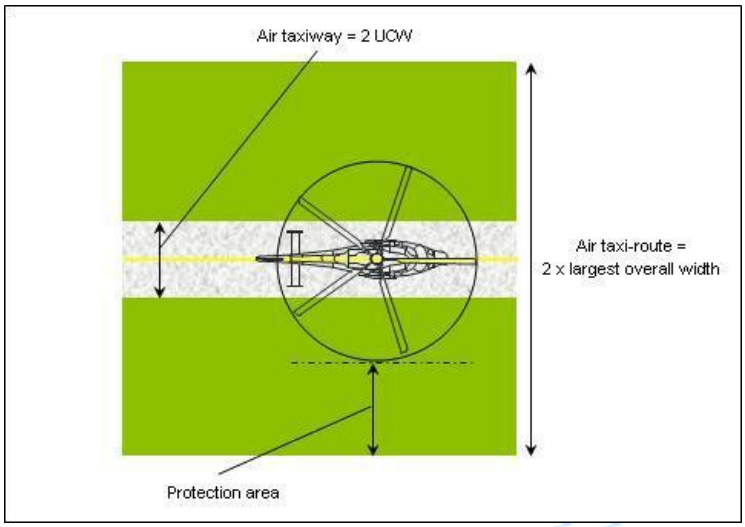

Figure 3-3. Helicopter air taxi-route/taxiway

Helicopter Stands

Note.— The provisions of this section do not specify the location for helicopter stands but allow a high degree of flexibility in the overall design of the heliport. However, it is not considered good practice to locate helicopter stands under a flight path. See Heliport Manual (Doc 9261) for further guidance.

3.1.50 When a TLOF is collocated with a helicopter stand, the protection area of the stand shall not overlap the protection area of any other helicopter stand or associated taxi route.

3.1.51 The helicopter stand shall provide rapid drainage but the slope in any direction shall not exceed 2 per cent.

Note.— The requirements on the dimensions of helicopter stands assume the helicopter will turn in a hover when operating over a stand.

Note — Where simultaneous hover operations are to be provided for, the separation distances specified in Table 3-1 between two air taxiways are to be applied.

3.1.52 A helicopter stand intended to be used by helicopters turning in a hover shall be of sufficient size to contain a circle of diameter of at least the largest over-all dimension of the largest helicopter the stand is expected to serve (see Figure 3-4).

3.1.53 When a helicopter stand is intended to be used for taxi through and where the helicopter using the stand is not required to turn, the minimum width of the stand and associated protection area shall be that of the taxi-route.

3.1.54 Where a helicopter stand is intended to be used for turning, the minimum dimension of the stand and protection area shall be not less than 2 D.

3.1.55 Where a helicopter stand is intended to be used for turning, it shall be surrounded by a protection area which extends for a distance of 0.4 D from the edge of the helicopter stand.

3.1.56 For simultaneous operations, the protection areas of helicopter stands and their associated taxi routes shall not overlap (see Figure 3-5).

Note.— Where non-simultaneous operations are envisaged, the protection areas of helicopter stands and their associated taxi-routes may overlap (see Figure 3-6).

3.1.57 A helicopter stand and associated protection area intended to be used for air taxiing shall provide ground effect.

3.1.58 No fixed raised object shall be permitted above the surface of the ground on a helicopter stand.

3.1.59 No fixed raised object shall be permitted in the protection area around a helicopter stand except for frangible objects, which because of their function, must be located there.

3.1.60 No mobile object shall be permitted on a helicopter stand and the associated protection area during helicopter movements.

3.1.61 Objects whose function requires them to be located in the protection area shall not:

a) if located at a distance of less than 0.75 D from the centre of the helicopter stand, penetrate a plane at a height of 5 cm above the plane of the central zone; and
b) if located at distance of 0.75 D or more from the centre of the helicopter stand, penetrate a plane at a height of 25 cm above the plane of the central zone and sloping upwards and outwards at a gradient of 5 per cent.

3.1.62 The central zone of a helicopter stand shall be

capable of withstanding the traffic of helicopters it is intended to serve and have a static load-bearing area:

a) of diameter not less than 0.83 D of the largest helicopter it is intended to serve; or

b) for a helicopter stand intended to be used for taxi-through, and where the helicopter using the stand is not required to turn, the same width as the helicopter ground taxiway.

Note.— For a helicopter stand intended to be used for turning on the ground by wheeled helicopters, the dimension of helicopter stand, including the dimension of the central zone. would need to be significantly increased. See Heliport Manual (Doc 9261) for further guidance.

Location of a final approach and take-off area in relation to a runway or taxiway

3.1.63 Where a FATO is located near a runway or taxiway, and where simultaneous operations are planned, the separation distance between the edge of a runway or taxiway and the edge of a FATO shall not be less than the appropriate dimension in Table 3-1.

3.1.64 A FATO should not be located:

a) near taxiway intersections or holding points where jet engine ejj7ux is likely to cause high turbulence; or

b) near areas where aeroplane vortex wake generation is likely to exist.

If aeroplane mass and/or helicopter mass are	Distance between FATO edge and runway edge or taxiway edge
up to but not including 3175 kg	60 m
3175 kg up to but not including 5 760 kg	120 m
5 760 kg up to but not including 100 000 kg	180 m
100 000 kg and over	250 m

Table 3-1. FATO minimum separation distance

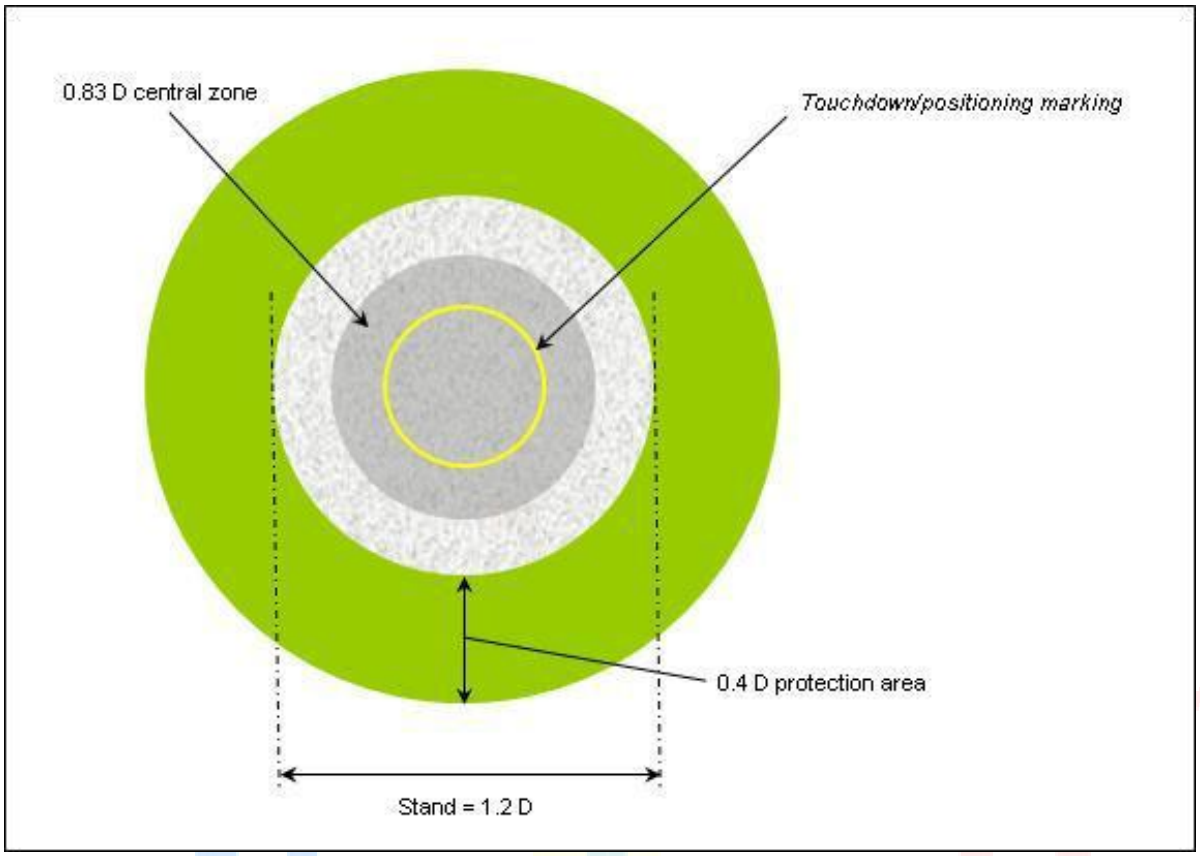

Figure 3-4. Helicopter stand and associated protection area

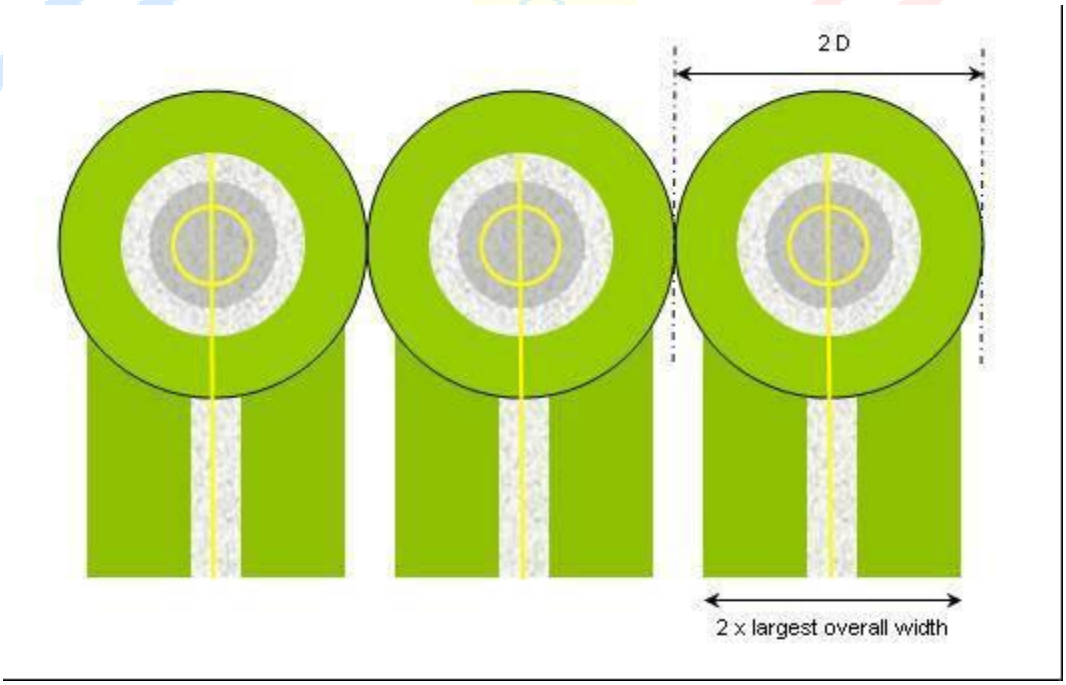

Figure 3-5. Helicopter stands designed for hover turns with air taxi-routes/taxiways — simultaneous operations

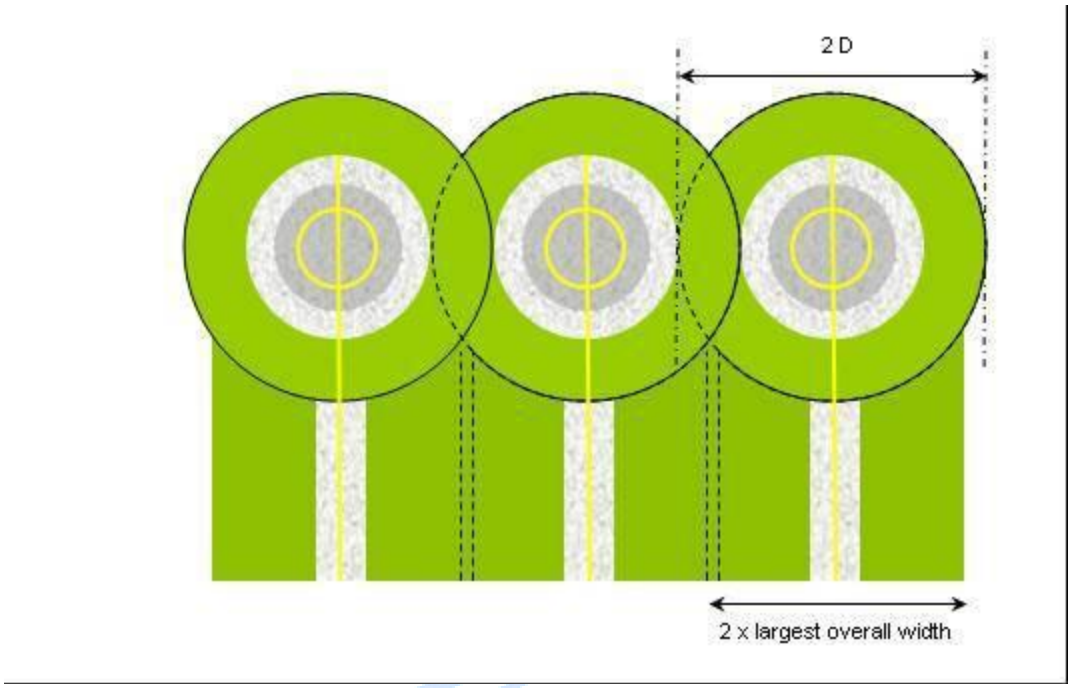

Figure 3-6. Helicopter stands designed for hover turns with air taxi-routes/taxiways — non-simultaneous operations

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3.2 Elevated Heliports

Note 1. — Guidance on structural design for elevated heliports is given in the Heliport Manual (Doc 9261).

Note 2.— On elevated heliports it is presumed that the FATO and TLOF will be coincidental. Such an area, of which there may be one or more at an elevated heliport, is referred to as a ―FATO/TLOF‖ in this section.

Note 3.— The provisions given in this section are based on the design assumption that no more than one helicopter will be in the FATO/TLOF at the same time.

Note 4.— The design provisions given in this section assume when conducting operations to a FATO/TLOF in proximity to another FATO/TLOF, these operations will not be simultaneous. If simultaneous helicopter operations are required, appropriate separation distances between FATO/TLOFs need to be determined, giving due regard to such issues as rotor downwash and airspace, and ensuring the flight paths for each FATO/TLOF, defined in Chapter 4, do not overlap.

Note 5.— The specifications for ground taxi-routes and air taxi-routes are intended for the safety of simultaneous operations during the manoeuvring of helicopters. However, the wind velocity induced by the rotor downwash might have to be considered.

3.2.1 In the case of elevated heliports, design considerations of the different elements of the heliport shall take into account additional loading resulting from the presence of personnel, snow, freight, refueling, firefighting equipment, etc.

Final approach and take-off area and touchdown and lift-off area

3.2.2 An elevated heliport shall be provided with at least one FATO.

3.2.3 A FATO shall be obstacle free.

3.2.4 The dimensions of the FATO shall be:

a) where intended to be used by helicopters operated in performance class 1, as prescribed in the helicopter flight manual (HFM) except that, in the absence of width specifications, the width shall be not less than 1 D of the largest helicopter the FATO is intended to serve;

b) for where intended to be used by helicopters operated in performance class 2 or 3, of sufficient size and shape to contain an area within which can be drawn a circle of diameter not less than:

   i) 1 D of the largest helicopter when the MTOM of helicopters the FATO is intended to serve is more than 3175 kg,

   ii) 0.83 D of the largest helicopter when the MTOM of helicopters the FATO is intended to serve is 3175 kg or less.

3.2.5 Where intended to be used by helicopters operated in performance class 2 or 3 with MTOM of 3175 kg or less, the FATO should be of sufficient size and shape to contain an area within which can be drawn a circle of diameter not less than 1 D.

Note.— Local conditions, such as elevation and temperature, may need to be considered when determining the size of a FATO. Guidance is given in the Heliport Manual.

3.2.6 Slopes on the FATO at an elevated heliport shall be sufficient to prevent accumulation of water on the surface of the area, but shall not exceed 2 per cent in any direction.

3.2.7 The FATO shall be dynamic load bearing.

3.2.8 The surface of the FATO shall:

a) be resistant to the effects of rotor downwash; and

b) be free of irregularities that would adversely affect the take-off or landing of helicopters

3.2.9 The FATO should provide ground effect

Helicopter Clearways

3.2.10 When a helicopter clearway is provided, it shall be located beyond the end of the rejected take-off area available.

3.2.11 The width of a helicopter clearway should be less than of the associated safety area.

3.2.12 When solid, the surface of the helicopter clearway should not project above a plane having an upward slope of 3 per cent, the lower limit of this plane being a horizontal line which is located on the periphery of the FAOT.

3.2.13 An object situated on a helicopter clearway which may endanger helicopters in the air should regarded as an obstacle and should be removed.

Touchdown and lift-off areas.

3.2.14 One TLOF shall be coincided with the FATO.

Note. Additional TLOFs may be be collocated with helicopter stands

3.2.15 For a TLOF coincided with the FATO, the dimensions and the characteristics of the TLOF shall be the same as those of the FATO.

3.2.16 When the TLOF is collocated with a helicopter stand, the TLOF shall be sufficient size to contain a circle of diameter of at least 0.83D of the largest helicopter the area is intended to serve.

3.2.17 Slopes on a TLOF collocated with a helicopter stand shall be sufficient to prevent accumulation of water on the surface of the area, but shall not exceed 2

per cent in any direction.

3.2.18 When the TLOF is collocated with a helicopter stand and intended to be used by ground taxiing helicopters only, the TLOF shall at least be static load-bearing and be capable of withstanding the traffic of the helicopters the area is intended to serve.

3.2.19 When the TLOF is collocated with a helicopter stand and intended to be used by air taxiing helicopters, the TLOF shall have a dynamic load-bearing area.

Safety area

3.2.20 The FATO shall be surrounded by a safety area which need not be solid

3.2.21 A safety area surrounding a FATO intended to be used by helicopters operated in performance class 1 in visual meteorological conditions (VMC) shall extend outwards from the periphery of the FATO for a distance of at least 3 m or 0.25 D, whichever is greater, of the largest helicopter the FATO is intended to serve and:

a) each external side of the safety area shall be at least 2 D where the FATO is quadrilateral; or

b) the outer diameter of the safety area shall be at least 2 D where the FATO is circular.

3.2.22 A safety area surrounding a FATO intended to be used by helicopters operated in performance class 2 or 3 in visual meteorological conditions (VMC) shall extend outwards from the periphery of the FATO for a distance of at least 3 mor 0.5 D, whichever is the greater, of the largest helicopter the FATO is intended to serve and:

a) each external side of the safety area shall be at least 2 D where the FATO is quadrilateral; or

b) the outer diameter of the safety area shall be at least 2 D where the FATO is circular

3.2.23 There shall be a protected side slope rising at 45 degrees from the edge of the safety area to a distance of 10 m, whose surface shall not be penetrated by obstacles, except that when obstacles are located to one side of the FATO only, theymay be permitted to penetrate the side slope surface.

3.2.24 No fixed object 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

3.2.25 Objects whose function 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 nor penetrate a plane originating at a height of 25 cm above the edge of the FATO and sloping upwards and outwards from the edge of the FATO at a gradient of 5 per cent

3.2.26 In the case of a FATO of diameter less than 1 D, the maximum height of the objects whose functions require them to be located on the safety area should not exceed a height of 5 cm

3.2.27 The surface of the safety area, when solid, shall not exceed an upward slope of 4 per cent outwards from the edge of the FATO.

3.2.28 Where applicable, the surface of the safety area shall be prepared in a manner to prevent flying debris caused by rotor downwash.

3.2.29 The surface of the safety area abutting the FATO shall be continuous with the FATO.

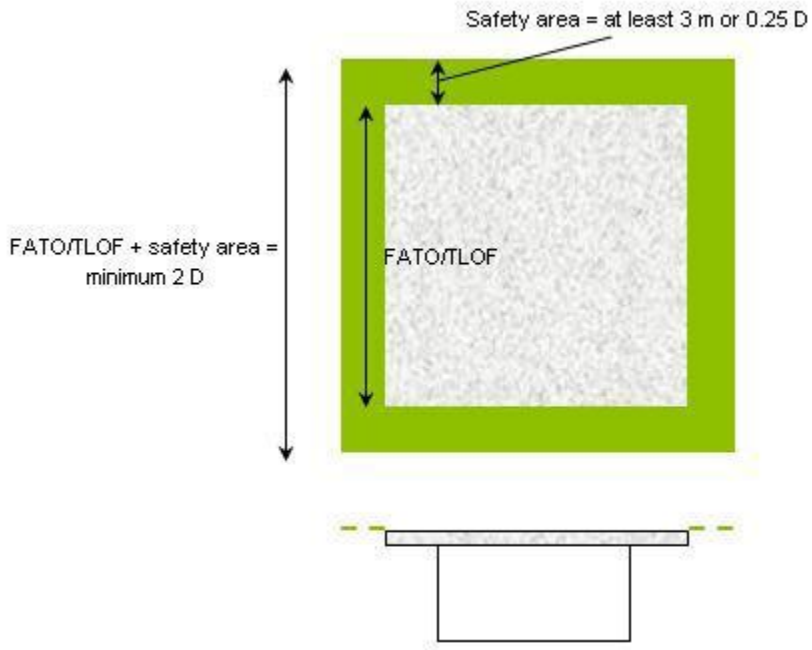

Figure 3-7. FATO and associated safety area

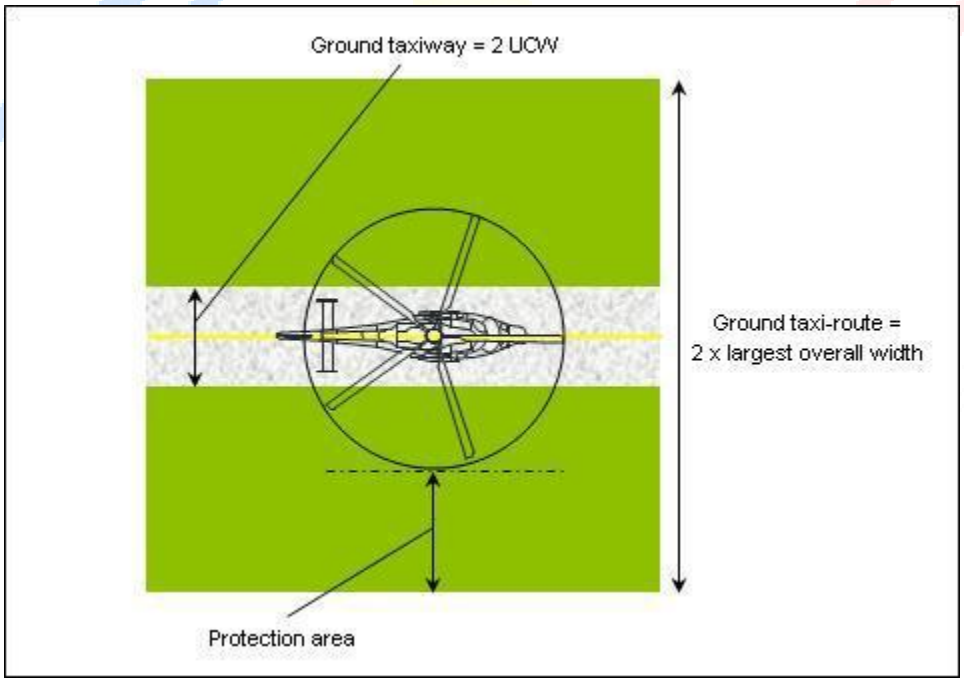

Figure 3-8. Helicopter ground taxi-route/taxiway

Helicopter ground taxiways and ground taxi-routes

Note.— The following specifications are intended for the safety of simultaneous operations during the manoeuvring of helicopters. However, the wind velocity induced by the rotor downwash might have to be considered.

3.2.30 The width of a helicopter ground taxiway shall not be less than 2 times the largest width of the undercarriage (UCW) of helicopters the ground taxiway is intended to serve (see Figure 3-8).

3.2.31 The longitudinal slope of a helicopter ground taxiway shall not exceed 3 per cent.

3.2.32 A helicopter ground taxiway shall be static load bearing and be capable of withstanding the traffic of helicopters that the helicopter ground taxiway is intended to serve.

3.2.33 A helicopter ground taxiway shall be centered in a ground taxi-route.

3.2.34 A helicopter ground taxi-route shall extend symmetrically on each side of the centerline to a distance not less than the largest overall width of the helicopters that it is intended to serve.

3.2.35 No objects shall be permitted on a helicopter ground taxi-route, except for frangible objects, which, because of their function, must be located there.

3.2.36 The helicopter ground taxiway and the ground taxi-route shall provide rapid drainage but the helicopter ground taxiway transverse slope shall not exceed 2 per cent.

3.2.37 The surface of a helicopter ground taxi-route shall be resistant to the effect of rotor downwash.

Helicopter air taxiways and taxi-routes

Note. — A helicopter air taxiway is intended to permit the movement of a helicopter above the surface at a height normally associated with ground effect and at groundspeed less than 37 km/h (20 kt).

3.2.38 The width of a helicopter air taxiway shall be at least three times the largest undercarriage (UCW) of the helicopters that the air taxiway is intended to serve.

3.2.39 The surface of a helicopter air taxiway shall be dynamic load bearing.

3.2.40 The transverse slope of the surface of a helicopter air taxiway shall not exceed 2 per cent and the longitudinal slope shall not exceed 7 per cent. In any event, the slopes shall not exceed the slope landing limitations of the helicopters the air taxiway is intended to serve.

3.2.41 A helicopter air taxiway shall be centered in an air taxi-route.

3.2.42 A helicopter air taxi-route shall extend symmetrically on each side of the centerline to a distance not less than the largest overall width of the helicopters that it is intended to serve.

3.2.43 No objects shall be permitted on an air taxi-route, except for frangible objects, which, because of their function, must be located thereon.

3.2.44 The surface of an air taxi-route shall be resistant to the effect of rotor downwash.

3.2.45 The surface of an air taxi-route shall provide ground effect.

Helicopter stands

3.2.46 The slope in any direction on a helicopter shall not exceed 2 per cent.

3.2.47 A helicopter stand intended to be used by helicopter turning in a hovershall be of sufficient size to contain a circle of diameter of at least 1.2 D of the largest helicopters the stand is intended to serve (see Figure 3-4).

3.2.48 If a helicopter stand is used for taxi-through, the minimum width of the stand and associated protection area shall be that of the taxi-route.

3.2.49 When a helicopter stand is intended to be used for turning, the minimum dimension of the stand and protection area shall be not less than 2 D.

3.2.50 When a helicopter stand is used for turning, it shall be surrounded by a protection area which extends for a distance of 0.4 D from the edge of the helicopter stand.

3.2.51 For simultaneous operations, the protection areas of helicopter stands and their associated taxi routes shall not overlap.
Note.— Where non-simultaneous operations are envisaged, the protection areas of helicopter stands and their associated taxi-routes may overlap.

3.2.52 When intended to be used for ground taxi operations by wheeled helicopters, the dimensions of a helicopter stand shall take into account the minimum turn radius of the wheeled helicopters the stand is intended to serve.

3.2.53 A helicopter stand and associated protection area intended to be used for air taxiing shall provide ground effect.

3.2.54 No fixed objects shall be permitted on a helicopter stand and the associated protection area.

3.2.55 The central zone of a helicopter stand shall be capable of withstanding the traffic of helicopters that it

is intended to serve and have a load bearing area:

a) of diameter not less than 0.83 D of the largest helicopter it is intended to serve; or

b) for a helicopter stand intended to be used for taxi through, and where the helicopter using the stand is not required to turn, the same width as taxiway.

3.2.56 The central zone of a helicopter stand intended to be used for ground taxiing only shall be static load-bearing.

3.2.57 The central zone of a helicopter stand intended to be used for air taxiing shall be dynamic load bearing.

Note.— For a helicopter stand intended to be used for turning on the ground by wheeled helicopters, the dimension of the helicopter stand, including the dimension of the central zone, would need to be significantly increased. See Heliport Manual (Doc 9261) for further guidance.

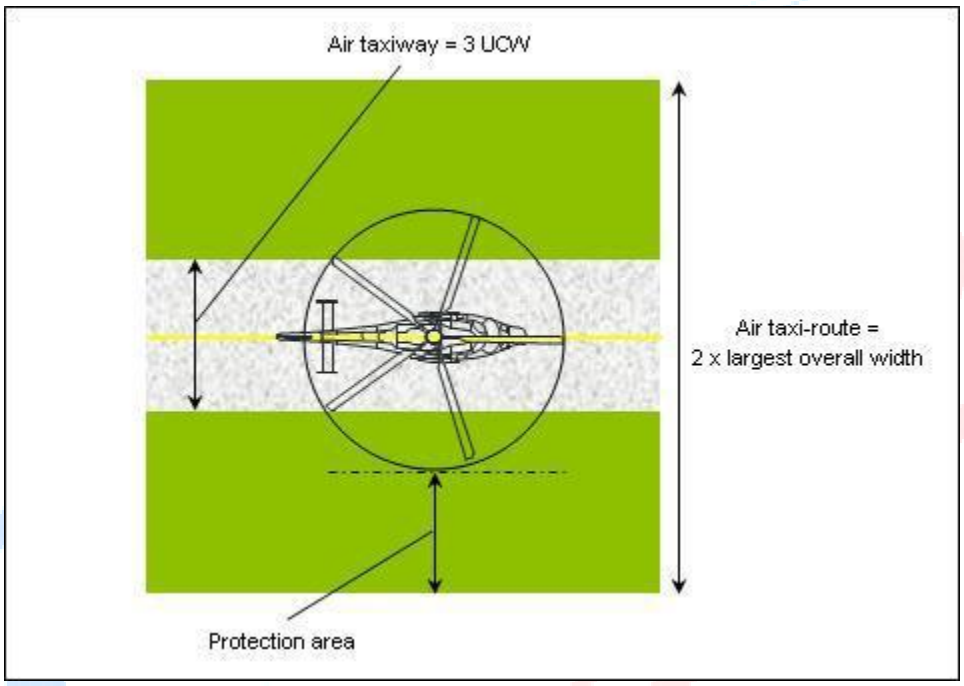

Figure 3-9. Helicopter air taxi-route/taxiway

3.3 Helidecks

Note — The following specifications are for helidecks located on structures engaged in such activities as mineral exploitation, research or construction. See 3.4 for shipboard heliport provisions.

Final approach and take-off area and TLOF

Note 1. — For helidecks that have a 1D or larger FATO it is presumed that the FATO and the TLOF will always occupy the same space and have the same load bearing characteristics so as to be coincidental. For helidecks that are less than 1D, the reduction in size is only applied to the TLOF which is load bearing area. In this case, the FATO remains at 1D but the portion extending beyond the TLOF perimeter needs not to be load bearing for helicopters. The TLOF and the FSTO may be assumed to be collocated.

Note 2. .— Guidance on the effects of airflow direction and turbulence, prevailing wind velocity and high temperatures from gas turbine exhausts or flare radiated heat on the location of the FATO is given in the Heliport Manual (Doc 9261).

3.3.1 The specifications in paragraphs 3.3.13 and 3.3.14 shall be applicable for helidecks completed on or after 1 January 2012

3.3.2 A helideck shall be provided with one FATO and one coincident or collocated TLOF.

3.3.2A A FATO may be any shape but shall be of sufficient size to contain an area within which can be accommodated a circle of diameter of not less than 1.0D of the largest helicopter the helideck is intended to serve.

3.3.3 A TLOF may be any shape but shall, for a single main rotor helicopter or side-by-side twin main rotor helicopter, be of sufficient size to contain:

a) for helicopters with a MTOM of more than 3175 kg, an area within which can be accommodated a circle of diameter of not less than 1.0 D of the largest helicopter the helideck is intended to serve.

b) for helicopters with a MTOM of 3175 kg or less, an area within which can be accommodated a circle of diameter of not less than 0.83 D of the largest helicopter the helideck is intended to serve.

3.3.4 For helicopters with a MTOM of 3175 kg or less, the TLOF should be of sufficient size to contain an area within which can be accommodated a circle of diameter of not less than 1.0 D of the largest helicopter the helideck is intended to serve.

3.3.5 A helideck shall be arranged to ensure that a sufficient and unobstructed air-gap is provided which encompasses the full dimensions of the FATO.

Note.- Specific guidance on the characteristics of an air-gap is given in the Heliport Manual (Doc 9261). As a general rule, except for shallow superstructures of three stories or less, a sufficient air-gap will be at-least 3m.

3.3.6 The FATO should be located so as to avoid, as far as is practicable, the influence of environmental effects, including turbulence, over the FATO, which could have an adverse impact on helicopter operations.

3.3.7 The TLOF shall be dynamic load bearing.

3.3.8 The TLOF shall provide ground effect.

3.3.9 No fixed object shall be permitted around the edge of the TLOF except for frangible objects, which, because of their function must be located thereon.

3.3.10 For any TLOF designed for use by helicopters having a D-value of greater than 16.0m, objects in the obstacle free sector whose function requires them to be located on the edge of the TLOF shall not exceed a height of 25 cm.

3.3.11 For any TLOF having a D-value of 16.0m or less, objects in the obstacle free sector whose function requires them to be located on the edge of the TLOF shall not exceed a height of 5 cm.

3.3.12 For any TLOF having dimensions of less than 1D, the maximum height of such objects in the obstacle free sector whose function requires them to be located on the edge of the FATO/TLOF shall not exceed a height of 5 cm.

Note.— Lighting that is mounted at a height of less than 25 cm is typically assessed for adequacy of visual cues before and after installation.

3.3.13 Objects whose function requires them to be located within the TLOF (such as lighting or nets) shall not exceed a height of 2.5 cm. Such objects shall only be present if they do not represent a hazard to helicopters.

Note.— Examples of potential hazards include nets or raised fittings on the deck that might induce dynamic rollover for helicopters equipped with skids.

3.3.14 Safety devices such as safety nets or safety shelves shall be located around the edge of a helideck but shall not exceed the height of the TLOF.

3.3.15 The surface of the TLOF shall be skid-resistant to both helicopters and persons and be sloped to prevent pooling of water.

Note. — Guidance on rendering the surface of the TLOF skid-resistant is contained in the Heliport Manual.

3.4 Shipboard heliports

3.4.1 The specifications in paragraphs, 3.4.15 and 3.4.16 shall be applicable to shipboard heliports completed on or after 1 January 2012 and 1 January 2015 respectively.

3.4.2 When helicopter operating areas are provided in the bow or stern of a ship or are purpose-built above the ship's structure, they shall be regarded as purpose-built shipboard heliports.

Final approach and take-off area and touchdown and lift-off area

Note.— Except for the arrangement described in 3.4.7 b) for shipboard heliports it is presumed that the FATO and the TLOF will be coincidental. Guidance on the effects of airflow direction and turbulence, prevailing wind velocity and high temperature from gas turbine exhausts or flare radiated heat on the location of the FATO is given in the Heliport Manual (Doc 9261).

3.4.3 A Shipboard heliports shall be provided with one FATO and one coincidental or collocated TLOF.

3.4.3A A FATO may be any shape but shall be of sufficient size to contain an area within which can be accommodated a circle of diameter of not less than 1.0 D of the largest helicopter the helideck is intended to serve.

3.4.4 The TLOF of a shipboard heliport shall be dynamic load-bearing.

3.4.5 The TLOF of a shipboard heliport shall provide ground effect.

3.4.6 For purpose-built shipboard heliports provided in a location other than the bow or stern the TLOF shall be of sufficient size to contain a circle with a diameter not less than 1.0 D of the largest helicopter the heliport is intended to serve.

3.4.7 For purpose-built shipboard heliports provided in the bow or stern of a ship, the TLOF shall be of sufficient size to:

a) contain a circle with a diameter not less than 1 D of the largest helicopter the heliport is intended to serve; or

b) for operations with limited touchdown directions, contain an area within which can be accommodated two opposing arcs of a circle with a diameter of not less than 1 D in the helicopters longitudinal direction. The minimum width of the heliport shall be not less than 0.83 D. (See Figure 3.10).

Note 1.— The ship will need to be manoeuvred to ensure that the relative wind is appropriate to the direction of the helicopter touchdown heading.

Note 2.— The touchdown heading of the helicopter is limited to the angular distance subtended by the 1 D arcs headings, minus the angular distance which corresponds to 15 degrees at each end of the arc.

3.4.8 For non-purpose built shipboard heliports, the TLOF shall be of sufficient size to contain a circle with a diameter not less than 1 D of the largest helicopter the heliport is intended to serve.

3.4.9 A shipboard heliport shall be arranged to ensure that a sufficient and unobstructed air-gap is provided which encompasses the full dimensions of the FATO.

Note.— Specific guidance on the characteristics of an air-gap is given in the Heliport Manual (doc 9261). As a general rule, except for shallow superstructures of three stories or less, a sufficient air-gap will be at-least 3m.

3.4.10 The FATO should be located so as to avoid, as far as is practicable, the influence of environmental effects, including turbulence, over the FATO, which could have an adverse impact on helicopter operations.

3.4.11 No fixed object shall be permitted around the edge of the TLOF except for frangible objects, which, because of their function, must be located thereon.

3.4.12 For any TLOF having a D-value of greater than 16.0m, objects in the obstacle free sector whose function requires them to be located on the edge of the TLOF shall not exceed a height of 25 cm.

3.4.13 For any TLOF having a D-value of 16.0m or less, objects in the obstacle free sector, whose function requires them to be located on the edge of the TLOF, shall not exceed a height of 5 cm.

3.4.14 For any TLOF having dimensions of less than 1D, the maximum height of such objects in the obstacle free sector whose function requires them to be located on the edge of the FATO shall not exceed a height of 5 cm.

Note.— Lighting that is mounted at a height of less than 25 cm is typically assessed for adequacy of visual cues before and after installation.

3.4.15 Objects whose function requires them to be located within the TLOF (such as lighting or nets) shall not exceed a height of 2.5 cm. Such objects shall only be present if they do not represent a hazard to helicopters.

3.4.16 Safety devices such as safety nets or safety shelves shall be located around the edge of a shipboard heliport, except where structural protection exists, but shall not exceed the height of the TLOF.

3.4.17 The surface of the TLOF shall be skid-resistant to both helicopters and persons

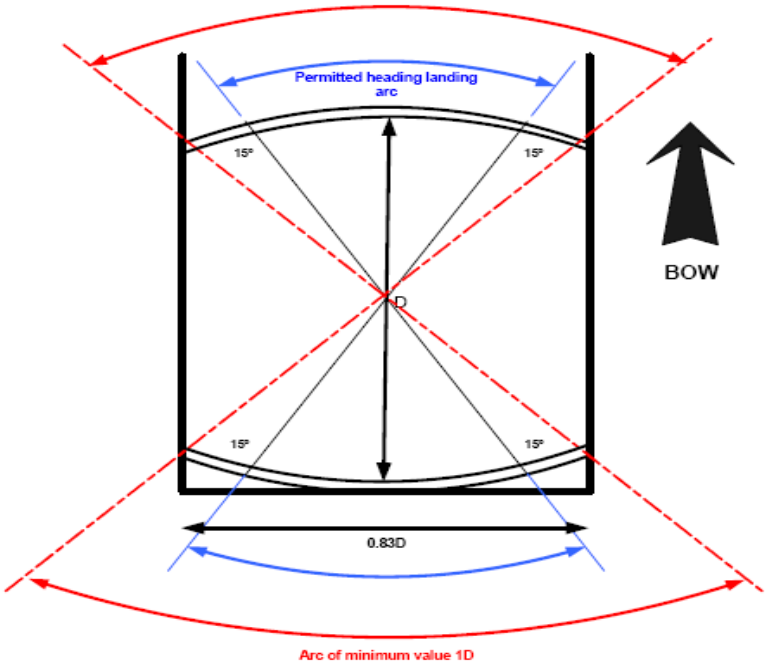

Figure 3-10. Shipboard permitted landing headings for limited heading operations

CHAPTER 4 – OBSTACLE ENVIRONMENT

Note — The objectives of the specifications in this chapter are to describe the airspace around heliports so as to permit intended helicopter operations to be conducted safely and to prevent, where appropriate State controls exist, heliports from becoming unusable by the growth of obstacles around them. This is achieved by establishing a series of obstacle limitation surfaces that define the limits to which objects may project into the airspace.

4.1 Obstacle limitation surfaces and sectors

Approach surface

4.1.1 Description. An inclined plane or, when a turn is involved, a complex surface sloping upwards from the end of the safety area and centered on a line passing through the centre of the FATO.

Note. — See Figure 4-1, 4-2, 4-3 and 4-4 for depiction of surfaces. See Table 4-1 for dimensions and slopes of surfaces.

4.1.2 Characteristics. The limits of an approach surface shall comprise:

a) an inner edge horizontal and equal in length to the minimum specified width/diameter of the FATO plus the safety area, perpendicular to the centre line 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 diverging uniformly at a specified rate from the vertical plane containing the centre line of the FATO; and

c) an outer edge horizontal and perpendicular to the centre line of the approach surface and at a specified height of 152 m (500 ft) above the elevation of the FATO.

4.1.3 The elevation of the inner edge shall be the elevation of the FATO at the point on the inner edge that is intersected by the centre line of the approach surface. For heliports intended to be used by helicopters operated in performance class 1 and when approved by an appropriate authority, the origin of the inclined plane may be raised directly above the FATO.

4.1.4 The slope(s) of the approach surface shall be measured in the vertical plane containing the centre line of the surface.

4.1.5 In the case of an approach surface involving a turn, the surface shall be a complex surface containing the horizontal normal‘s to its centre line and the slope of the centre line shall be the same as that for a straight take-off climb surface.

Note. – See Figure 4-5

4.1.6 In the case of an approach surface involving a turn, the surface shall not contain more than one curved portion.

4.1.7 Where a curved portion of an approach surface is provided the sum of the radius of arc defining the centre line of the approach surface and the length of the straight portion originating at the inner edge shall not be less than 575 m.

4.1.8 Any variation in the direction of the centre line of an approach surface shall be designed so as not to necessitate a turn radius less than 270 m.

Note.— For heliports intended to be used by performance class 2 and 3, it is good practice for the approach paths to be selected so as To permit safe forced landing or one-engine-inoperative landings such that, as a minimum requirement, injury of persons on the ground or water or damage to property are minimized. The most critical helicopter type for which the heliport is intended and the ambient conditions may be factors in determining the suitability of such areas.

Transitional surface

Note. – For a FATO at a heliport without a PinS approach incorporating a visual segment surface (VSS) there is no requirement to provide transitional surfaces.

4.1.9 Description. A complex surface along the side of the safety area and part of the side of the approach/take-off climb surface, that slopes upwards and outwards to a predetermined height of 45 m (150 ft).

Note. – See Figure 4-3 Transitional Surfaces. See Table 4-1 for dimensions and slopes of surfaces.

4.1.10 Characteristics. The limits of a transitional surface shall comprise:

a) a lower edge beginning at a point on the side of the approach/take-off climb surface at a specified height above the lower edge extending down the side of the approach/take-off climb surface to the inner edge of the approach/take-off climb surface and from there along the length of the side of the safety area parallel to the centre line of the FATO; and

b) an upper edge located at a specified height above the lower edge as set out in Table 4-1.

4.1.11 The elevation of a point on the lower edge shall be:

a) along the side of the approach/take-off climb surface - equal to the elevation of the approach/take off climb surface at that point; and

b) along the safety area - equal to the elevation of the inner edge of the approach/take-off climb surface.

Note 1.— If the origin of the inclined plane of the approach/take-off climb surface is raised as approved by an appropriate authority, the elevation of the origin of the transitional surface will be raised accordingly.

Note 2.— As a result of b) the transitional surface along the safety area will be curved if the profile of the FATO is curved, or a plane if the profile is a straight line.

4.1.12 The slope of the transitional surface shall be measured in a vertical plane at right angles to the centre line of the FATO.

Take-off climb surface

4.1.13 Description. 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 and centered on a line passing through the centre of the FATO

Note 2. - See Figure 4-1, 4-2, 4-3 and 4-4 for depiction of surfaces. See Table 4-1 for dimensions and slopes of surfaces.

4.1.14 Characteristics. The limits of a take-off climb surface shall comprise:

a) an inner edge horizontal and equal in length to the minimum specified width/diameter of the FATO plus the safety area, perpendicular to the centre line 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 centre line of the FATO; and

c) an outer edge horizontal and perpendicular to the centre line of the take-off climb surface and at a specified height of 152 m (500 ft) above the elevation of the FATO.

4.1.15 The elevation of the inner edge shall be the elevation of the FATO at the point on the inner edge that is intersected by the centre line of the take-off climb surface. For heliports intended to be used by heliporters operated in performance class 1 and when approved by an appropriate authority, the origin of the inclined plane may be raised directly above the FATO.

4.1.16 Where a clearway is provided the elevation of the inner edge of the take-off climb surface shall be located at the outer edge of the clearway at the highest point on the ground based on the centre line of the clearway.

4.1.17 In the case of a straight take-off climb surface, the slope shall be measured in the vertical plane containing the centre line of the surface.

4.1.18 In the case of a take-off climb surface involving a turn, the surface shall be a complex surface containing the horizontal normal's to its centre line and the slope of the centre line shall be the same as that for a straight take-off climb surface.

4.1.19 In the case of a take-off climb surface involving a turn, the surface shall not contain more than one curved portion.

4.1.20 Where a curved portion of a take-off climb surface is provided the sum of the radius of arc defining the centre line of the take-off climb surface and the length of the straight portion originating at the inner edge shall not be less than 575 m.

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

Note 1.– Helicopter take-off performance is reduced in a curve and as such a straight portion along the take-off climb surface prior to the start of the curve allows for acceleration.

Note 2. — For heliports intended to be used by performance class 2 and 3 it is good practice for departure paths to be selected so as to permit safe forced landings or one-engine-inoperative landings such that, as a minimum requirement, injury to persons on the ground or water or damage to property are minimized. The most critical helicopter type for which the heliport is intended and the ambient conditions may be factors in determining the suitability of such areas.

Obstacle-free sector/surface – helidecks

4.1.22 Description. A complex surface originating at and extending from, a reference point on the edge of the FATO of a helideck. In the case of a TLOf of less than 1 D, the reference point shall be located not less than 0.5 D from the centre of the TLOF.

4.1.23 Characteristics. An obstacle-free sector/surface shall subtend an arc of specified angle.

4.1.24 A helideck obstacle-free sector shall comprise of two components, one above and one below helideck level

Note: See Figure 4-7.

a) Above helideck level: The surface shall be a horizontal plane level with the elevation of the helideck surface that subtends an arc of at least 210° with the apex located on the periphery of the D circle extending outwards to a distance that will allow for an unobstructed departure path appropriate to the helicopter the helideck is intended to serve.

b) Below helideck level: Within the (minimum) 210° arc, the surface shall additionally extend downward from the edge of the FATO below the elevation of the helideck to water level for an arc

of not less than 180° that passes through the centre of the FATO and outwards to a distance that will allow for safe clearance from the obstacles below the helideck in the event of an engine failure for the type of helicopter the helideck is intended to serve.

Note.— For both the above obstacle free sectors for helicopters operated in Performance class 1 or 2 the horizontal extent of these distances from the helideck will be compatible with the one-engine inoperative capability of the helicopter type to be used.

Limited obstacle surface – helidecks

Note.— Where obstacles are necessarily located on the structure, a helideck may have a limited obstacle sector.

4.1.25 Description. A complex surface originating at the reference point for the obstacle-free sector and extending over the arc not covered by the obstacle-free sector as shown in Figures 4-3, 4-4 and 4-5 and within which the height of obstacles above the level of the TLOF will be prescribed.

4.1.26 Characteristics. A limited obstacle sector shall not subtend an arc greater than 150 degrees.
Its dimensions and location shall be as indicated in Figure 4-8 for a 1D FATO with coincidentental TLOF and Figure 4-9 for a 0.83D TLOF.

4.2 Obstacle limitation requirements

Note 1.— The requirements for obstacle limitation surfaces are specified on the basis of the intended use of a FATO, i.e. approach manoeuvre to hover or landing, or take-off manoeuvre and type of approach, and are intended to be applied when such use is made of the FATO. In cases where operations are conducted to or from both directions of a FATO, then the function of certain sulfates may be nullified because of more stringent requirements of another lower surface.

Note 2.– If a Visual approach slope indicator (VASI) is installed, there are additional obstacle protection surfaces, detailed in Chapter 5, that need to be considered and may be more demanding than the obstacle limitation surfaces prescribed in Table 4 -1.

Surface level heliports

4.2.1 The following obstacle limitation surfaces shall be established for a FATO at heliports with a PinS approach procedure utilizing a visual segment surface:

a) take-off climb surface:

b) approach surface; and

c) transitional surfaces.

Note 1.- See Figure 4-3 – Transitional Surfaces

Note 2.- Doc 8168, Volume II, Part IV – Helicopters, details further obstacle limitation surface requirements associated with a visual segment surface.

4.2.2 The following obstacle limitation surfaces shall be established for a FATO at heliports, other than specified in 4.2.1, including heliports with a PinS approach procedure where a visual segment surface is not provided:

a) take-off climb surface; and

b) approach surface.

4.2.3 The slopes of the obstacle limitation surfaces shall not be greater than, and their other dimensions not less than those specified in Tables 4-l and shall be located as shown in Figures 4-1, 4-2 and 4-6.

4.2.4 For heliports that have an approach/take-off climb surface with a 4.5% slope design, objects shall be permitted to penetrate the obstacle limitation surface, if the results of an aeronautical study approved by an appropriate authority have reviewed the associated risks and mitigation measures.

Note 1. The identified objects may limit the heliport operation.

Note 2. – Annex 6, Part 3 provides procedures that may be useful in determining the extent of obstacle penetration.

4.2.5 New objects or extensions of existing objects shall not be permitted above any of the surfaces in 4.2.1 to 4.2.2 except when shielded by an existing immovable object or after an aeronautical study approved by an appropriate authority, determines that the object will not adversely affect the safety or significantly affect the regularity of operations of helicopters.

Note — Circumstances in which the shielding principle may reasonably be applied are described in the Airport Services Manual, Part 6.

4.2.6 Existing objects above any of the surfaces in 4.2.1 to 4.2.2 above should, as far as practicable, be removed except when the object is shielded by an existing immovable object or after an aeronautical study *approved by an appropriate authority* determines that the object will not adversely affect the safety or significantly affect the regularity of operations of helicopters.

Note. — The application of curved approach or take-off climb surfaces as specified in 4.1.5 or 4.1.18 may alleviate the problems created by objects infringing these suitcase.

4.2.7 A surface level heliport shall have at least one approach and take off climb surface. An aeronautical study shall be undertaken by an appropriate authority when only a single approach and take-off climb surface is provided considering as a minimum, the following factors:

a. the area/terrain over which the flight is being conducted;
b. the obstacle environment surrounding the heliport;
c. the performance and operating limitations of helicopters intending to use the heliport; and
d. the local meteorological conditions including the prevailing winds.

4.2.8 A surface level heliport should have at least two approach and take-off climb surfaces to avoid downwind conditions, minimize crosswind conditions and permit for a balked landing.

Note. - See Heliport Manual (Doc 9261) for guidance.

Elevated heliports

4.2.9 The obstacle limitation surfaces for elevated heliports shall conform to the requirements for surface level heliports specified in 4.2.1 to 4.2.6.

4.2.10 An elevated heliport shall have at least one approach and take off climb surface. An aeronautical study shall be undertaken by an appropriate authority when only a single approach and take-off climb surface is provided considering as a minimum, the following factors:

a. the area/terrain over which the flight is being conducted;
b. the obstacle environment surrounding the heliport;
c. the performance and operating limitations of helicopters intending to use the heliport; and
d. the local meteorological conditions including the prevailing winds.

4.2.11 An elevated heliport should have at least two approach and take-off climb surfaces to avoid downwind conditions, minimize crosswind conditions and permit for a balked landing.

Note. - See Heliport Manual (Doc 9261) for guidance.

Helidecks

4.2.12 A helideck shall have an obstacle-free sector.

Note.— A helideck may have a limited obstacle sector (see 4.1.25)

4.2.13 There shall be no fixed obstacles within the obstacle-free sector above the obstacle-free surface.

4.2.14 In the immediate vicinity of the helideck, obstacle protection for helicopters shall be provided below the helideck level. This protection shall extend over an arc of at least 180° with the origin at the centre of the FATO, with a descending gradient having a ratio of one unit horizontally to five units vertically from the edges of the FATO within the 180° sector. This descending gradient may be reduced to a ratio of one unit horizontally to three within the 180° sector for multi-engine helicopters operated in performance class 1 or 2 (see Figure 4-7).

Note. — Where there is a requirement to position, at sea surface level, one or more offshore support vessel(s) (e.g. a Standby Vessel) essential to the operation of a fixed or floating offshore facility, but located within the proximity of the fixed or floating offshore facility, any offshore support vessel(s) would need to be positioned so as not to compromise the safety of helicopter operations during take-off departure and/or approach to landing.

4.2.15 For a TLOF of 1D and larger, within the 150° limited obstacle surface/sector out to a distance of, 0.12D measured from the point of origin of the limited obstacle sector, objects shall not exceed a height of 25 cm above the TLOF. Beyond that arc, out to an over-all distance of a further 0.21D measured from the end of the first sector, the limited obstacle surface rises at a rate of one unit vertically for each two units horizontally originating at a height 0.05D above the level of the TLOF (see Figure 4-8).

Note.- Where the area enclosed by the FATO/TLOF perimeter marking, is a shape other than circular, the extent of the LOS segments are represented as lines parallel to the perimeter of the landing area rather than arcs. Figure 4-8 has been constructed on the assumption that an octagonal helideck arrangement is provided. Further guidance for square (quadrilateral) and circular FATO/TLOF arrangements is given in the Heliport Manual (Doc 9261).

4.2.16 For a TLOF less than 1D, within the 150 degree limited obstacle surface/sector out to a distance of 0.62D and commencing from a distance 0.5D, both measured from the centre of the TLOF, objects shall not exceed a height of 5 cm above the TLOF. Beyond that arc, out to an overall distance of 0.83D from the centre of the TLOF, the limited obstacle surface rises at a rate of one unit vertically for each two units horizontally originating at a height 0.05D above the level of the TLOF (see Figure 4-9).

Note.- Where the area enclosed by the FATO/TLOF perimeter marking, is a shape other than circular, the extent of the LOS segments are represented as lines parallel to the perimeter of the TLOF rather than arcs. Figure 4-9 has been constructed on the assumption that an octagonal helideck arrangement is provided. Further guidance for square (quadrilateral) and circular FATO/TLOF arrangements is given in the Heliport Manual (Doc 9261).

Shipboard heliports

4.2.17 The specifications in paragraphs, 4.2.20 and 4.2.22 shall be applicable for shipboard heliports completed on or after 1 January 2012.

Purpose-built heliports located forward or aft

4.2.18 When helicopter operating areas are provided in the bow or stern of a ship they shall apply the obstacle criteria for helidecks.

Amidships location – *purpose built and non-purpose built*

4.2.19 Forward and aft of a TLOF of 1D and larger shall be two symmetrically located sectors, each covering an arc of 150°, with their apexes on the periphery of the TLOF. Within the area enclosed by these two sectors, there shall be no objects rising above the level of the TLOF, except those aids essential for the safe operation of a helicopter and then only up to a maximum height of 25 cm.

4.2.20 Objects whose function requires them to be located within the TLOF (such as lighting or nets) shall not exceed a height of 2.5 cm. Such objects shall only be present if they do not represent a hazard to helicopters.
Note.— Examples of potential hazards include nets or raised fittings on the deck that might induce dynamic rollover for helicopters equipped with skids.

4.2.21 To provide further protection from obstacles fore and aft of the TLOF, rising surfaces with gradients of one unit vertically to five units horizontally shall extend from the entire length of the edges of the two 150° sectors. These surfaces shall extend for a horizontal distance equal to at least the diameter of the TLOF and shall not be penetrated by any obstacle (see Figure 4-10).

Non-purpose built heliports

Ship's side location

4.2.22 No objects shall be located within the TOLF except those aids essential for the safe operation of a helicopter (such as nets or lighting) and then only up to a maximum height of 2.5cm. Such objects shall only be present if they do not represent a hazard to helicopters

4.2.23 From the fore and aft mid-points of the D circle in two segments outside the circle, limited obstacle areas shall extend to the ship's rail to a fore and aft distance of 1.5 times the diameter of the TLOF, located symmetrically about the athwartships bisector of the D circle. Within these areas there shall be no objects rising above a maximum height of 25cm above the level of the TLOF, (see Figure 4-11) Such objects shall only be present if they do not represent a hazard to helicopters.

4.2.24 A limited obstacle sector horizontal surface shall be provided, at least 0.25 D beyond the diameter of the D circle, which shall surround the inboard sides of the TLOF to the fore and aft mid-points of the D circle The limited obstacle sector shall continue to the ship's rail to a fore and aft distance of 2.0 times the diameter of the TLOF, located symmetrically about the athwart ships bisector of the D circle. Within this sector there shall be no objects rising above a maximum height of 25cm above the level of the TLOF

Note. Any objects located within the areas described in 4.2.23 and 4.2.24 that exceed the height of the FATO/TLOF are notified to the helicopter operator using a ship's helicopter landing area plan. For notification purposes it may be necessary to consider immoveable objects beyond the limit of the surface prescribed in 4.2.24 particularly if objects are significantly higher than 25 cm and in close proximity to the boundary of the Limited Obstacle Sector. See Heliport Manual (Doc 9261) for guidance.

Winching areas

4.2.25 An area designated for winching onboard ships shall be comprised of a circular clear zone of diameter 5 m and extending from the perimeter of the clear zone, a concentric manoeuvring zone of diameter 2 D. (see Figure 4-12)

4.2.26 The manoeuvring zone shall be comprised of 2 areas:

a) The inner manoeuvring zone extending from the perimeter of the clear zone and of a circle of diameter not less than 1.5 D; and

b) The outer manoeuvring zone extending from the perimeter of the inner manoeuvring zone and of a circle of diameter of not less than 2D.

4.2.27 Within the clear zone of a designated winching area, no objects shall be located above the level of its surface.

4.2.28 Objects located within the inner manoeuvring zone of a designated winching area shall not exceed a height of 3 m. 4.2.29 Objects located within the outer manoeuvring zone of a designated winching area shall not exceed a height of 6 m

4.2.29 Objects located within the outer manoeuvring zone of a designated winching area shall not exceed a height of 6 m.

Note. - See Heliport Manual (Doc 9261) for guidance.

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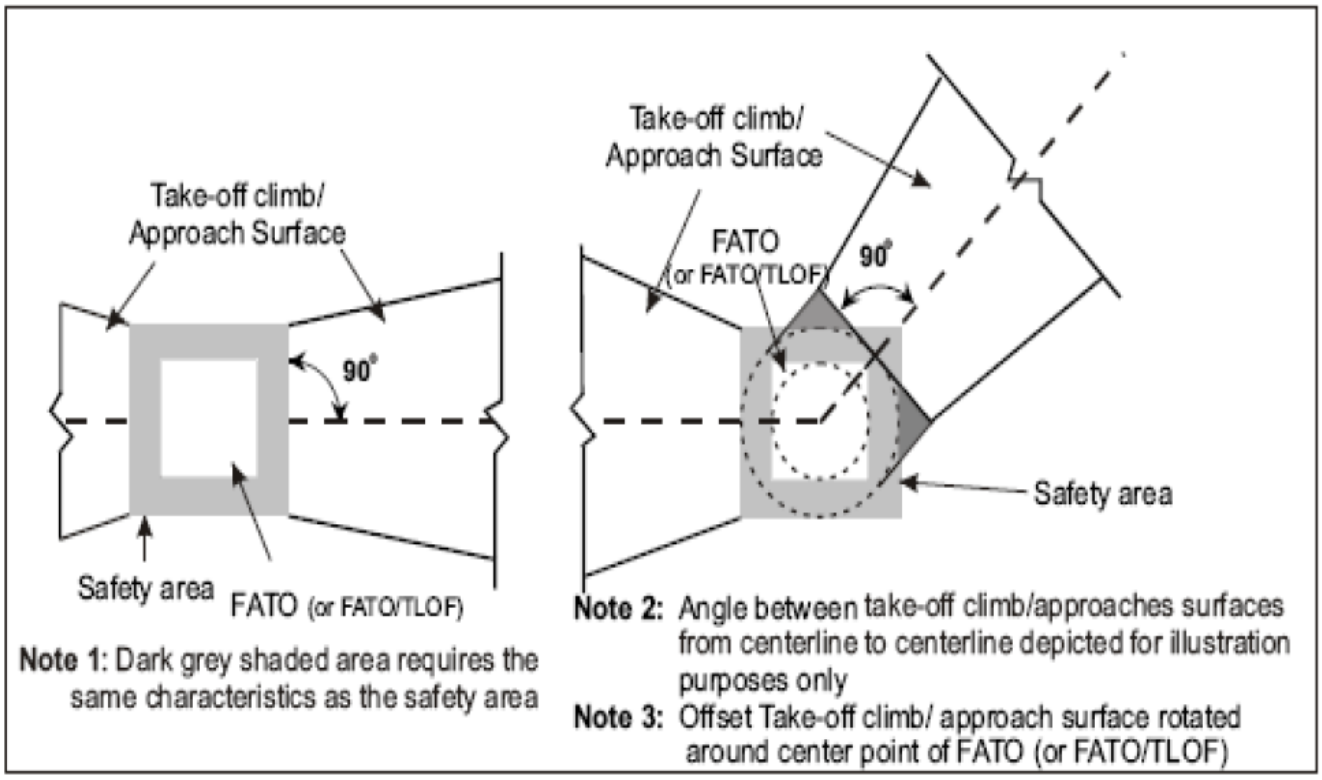


Figure 4- 1. Obstacle limitation surfaces – Take-off climb & Approach Surface

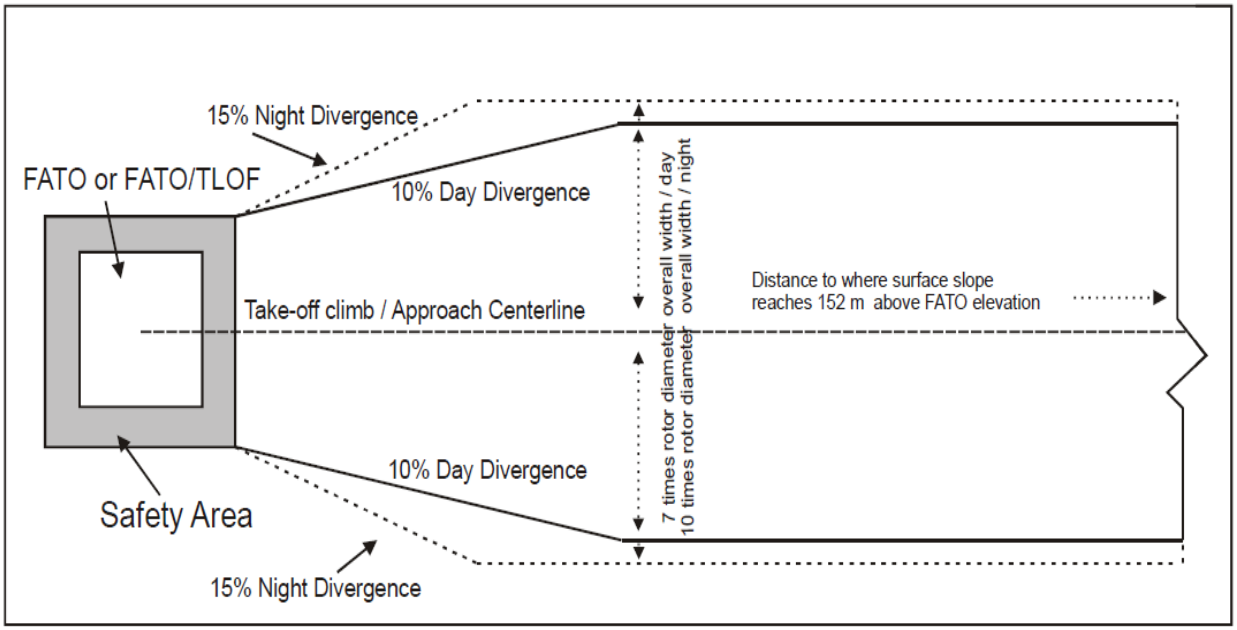


Figure 4-2 Take-off Climb / Approach Surface Width

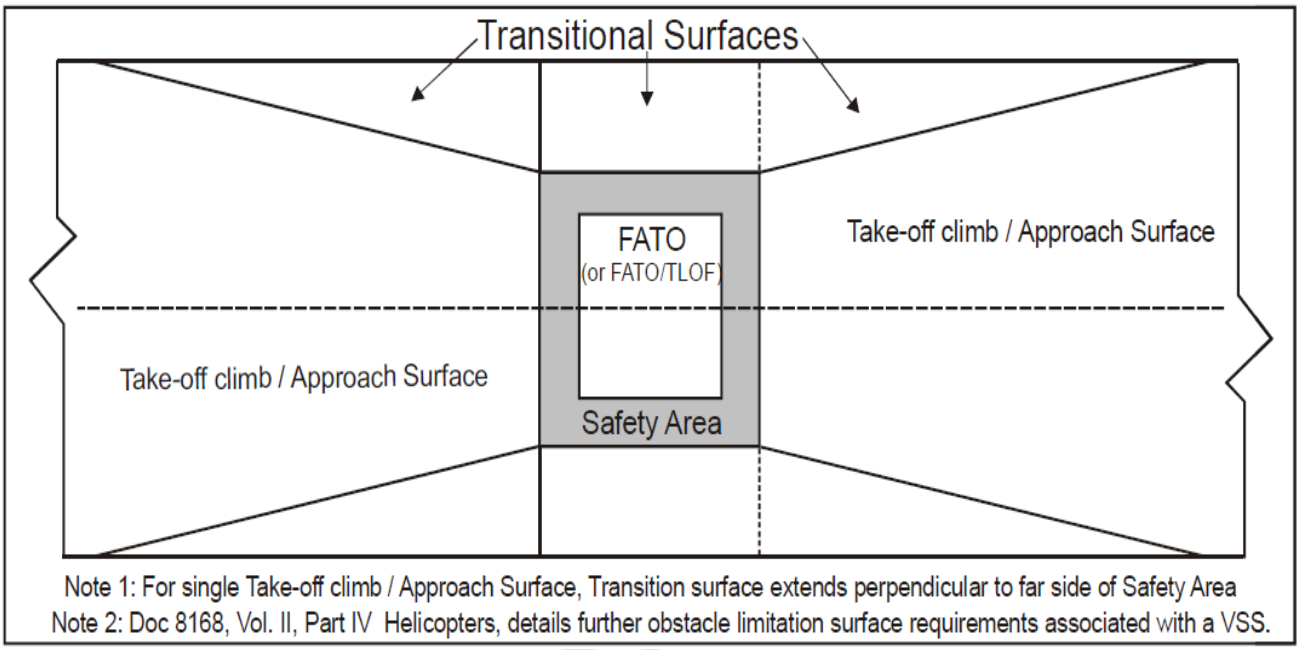


Figure 4-3 Transitional Surfaces for a FATO with a PinS approach procedure with a VSS

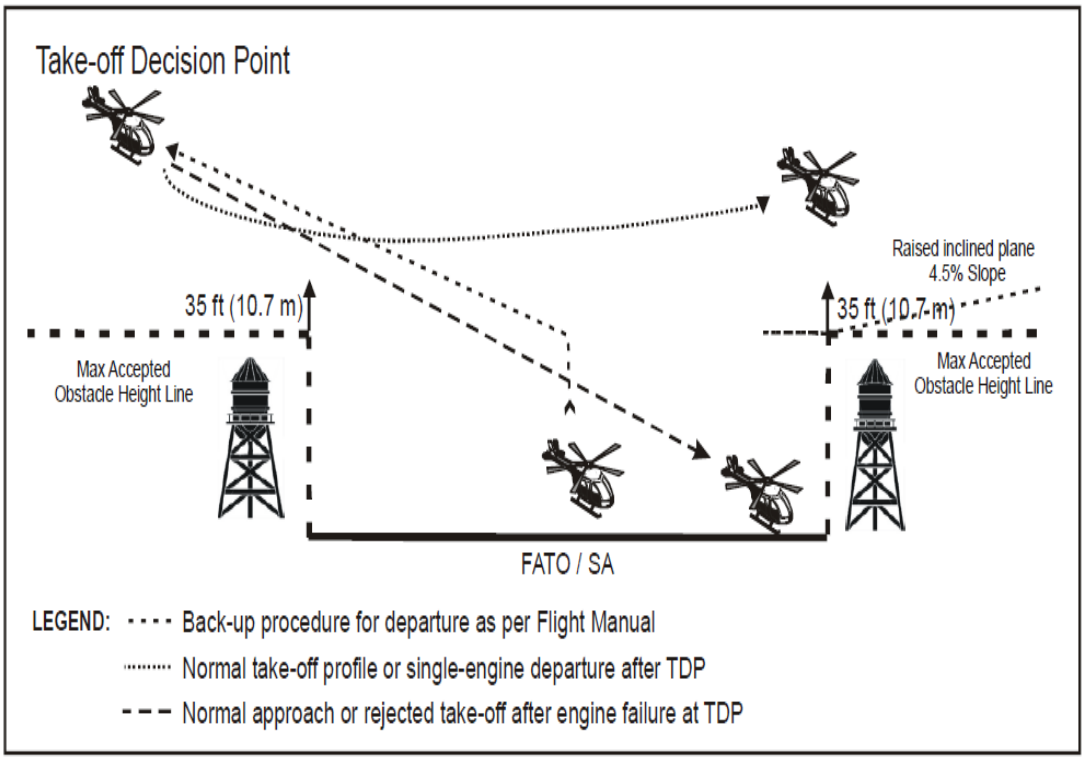
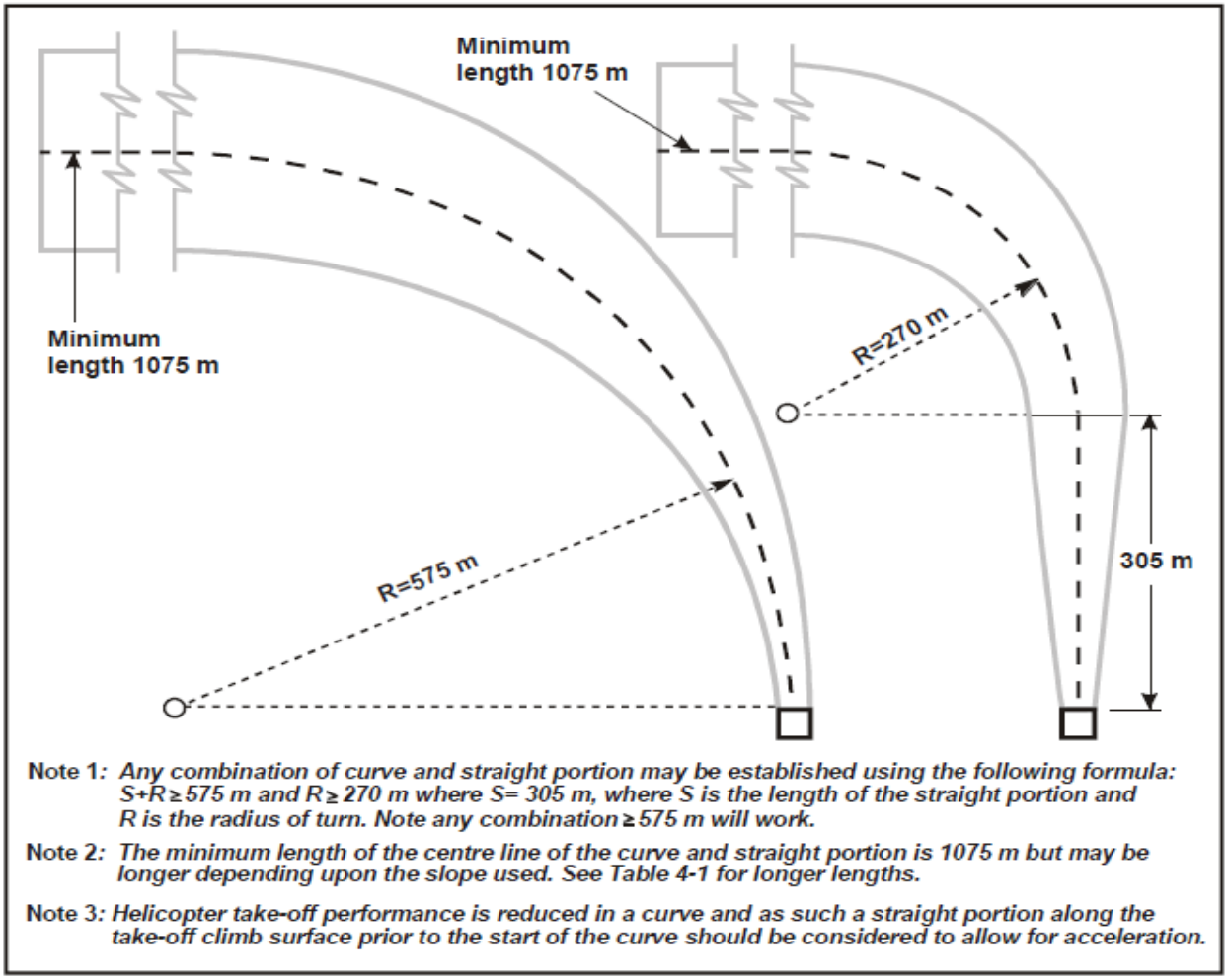


Figure 4-4 Example of Raised Inclined Plane During Operations in Performance Class 1

Note 1.- This example diagram does not represent any specific profile, technique or helicopter type and is intended to show a generic example. An approach profile and a back-up procedure for departure profile are depicted. Specific manufacturers operations in performance class 1 may be represented differently in the specific Helicopter Flight Manual. Annex 6, Part 3, Attachment A provides back-up procedures that may be useful for operations in performance class 1.

Note 2.– The approach / landing profile may not be the reverse of the take-off profile.

Note 3.– Additional obstacle assessment might be required in the area that a back-up procedure is intended. Helicopter performance and the Helicopter Flight Manual limitations will determine the extent of the assessment required.



Note 1: *Any combination of curve and straight portion may be established using the following formula: S+R ≥ 575 m and R ≥ 270 m where S= 305 m, where S is the length of the straight portion and R is the radius of turn. Note any combination ≥ 575 m will work.*

Note 2: *The minimum length of the centre line of the curve and straight portion is 1075 m but may be longer depending upon the slope used. See Table 4-1 for longer lengths.*

Note 3: *Helicopter take-off performance is reduced in a curve and as such a straight portion along the take-off climb surface prior to the start of the curve should be considered to allow for acceleration.*

Figure 4-5. Curved approach and take-off climb surface for all FATOs including FATO/TLOFs

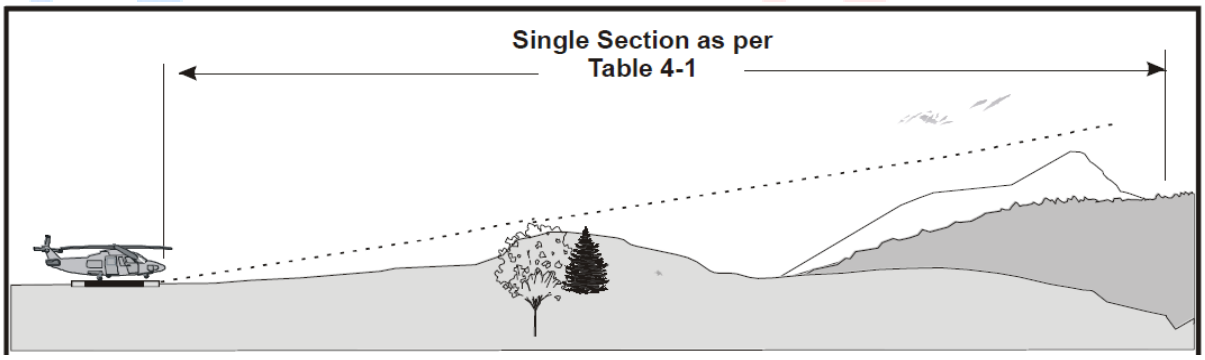


Figure 4-6(a) Approach & Take-off climb surfaces – "A" slope profile – typically 4.5%

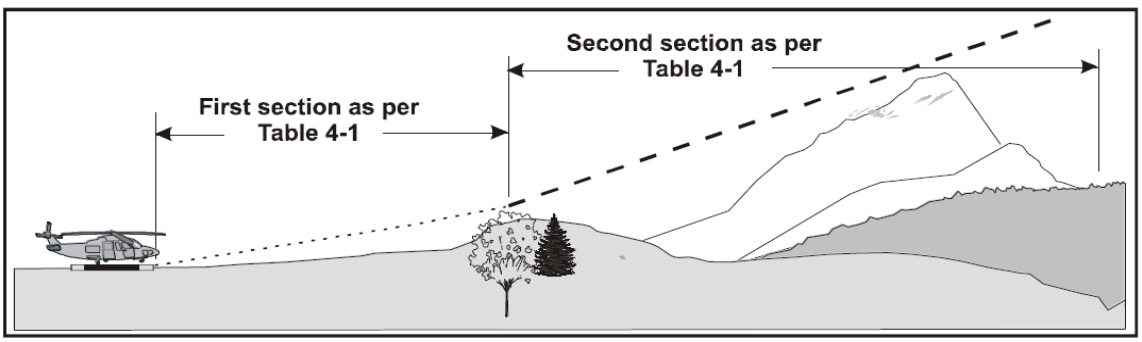


Figure 4-6(b) Approach & Take-off climb surface – "B" slope profile – typically 8% & 16%

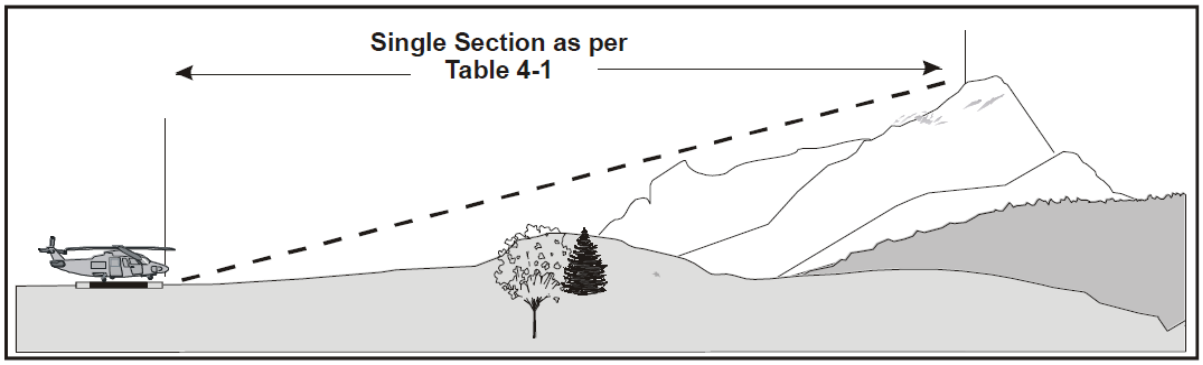


Figure 4-6(c) Approach & Take-off climb surface – "C" slope profile – typically 12.5%

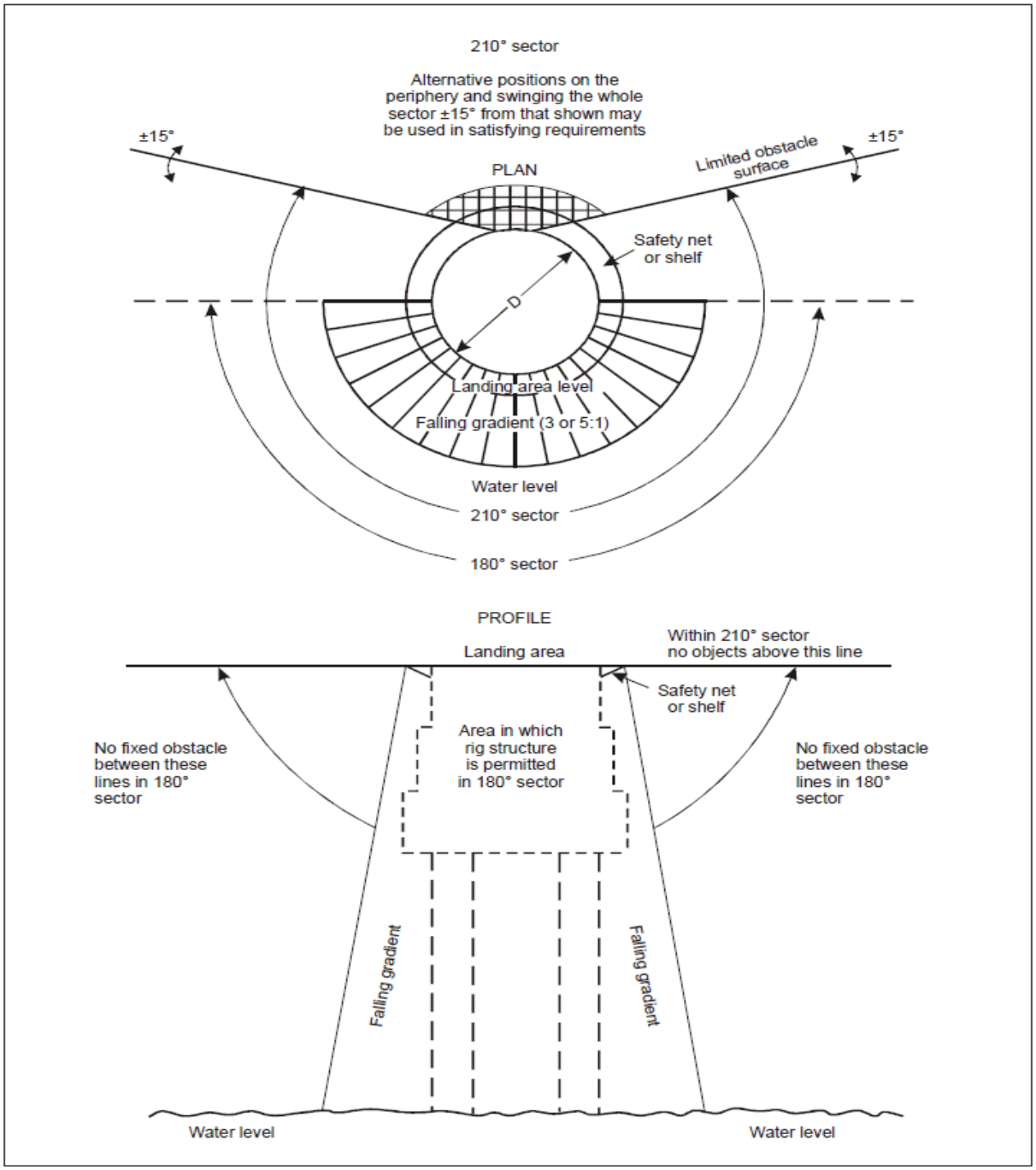


Figure 4-7 Helideck obstacle-free sector

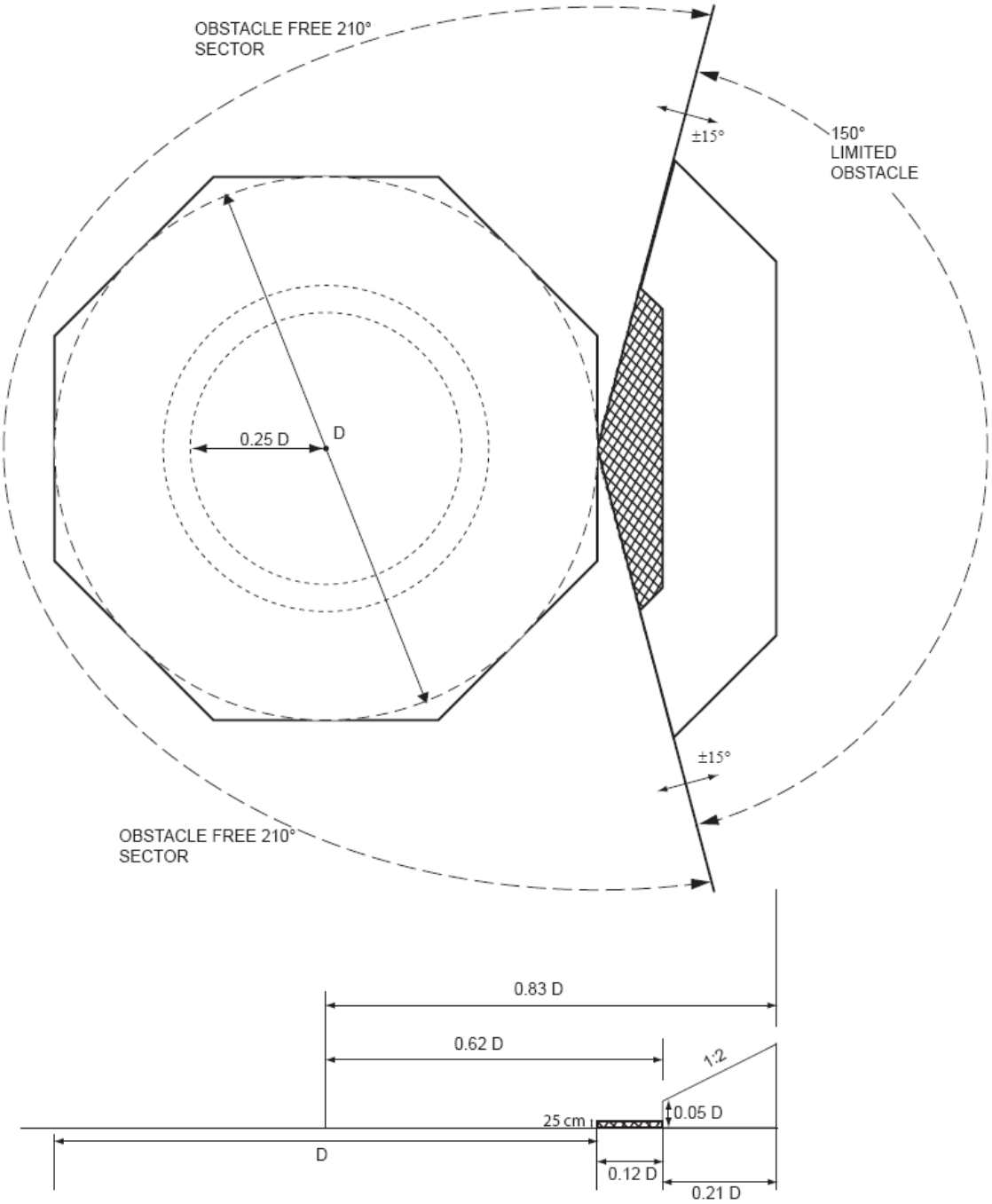


Figure 4-8. Helideck obstacle limitation sectors and surfaces for a 1D FATO/TLOF

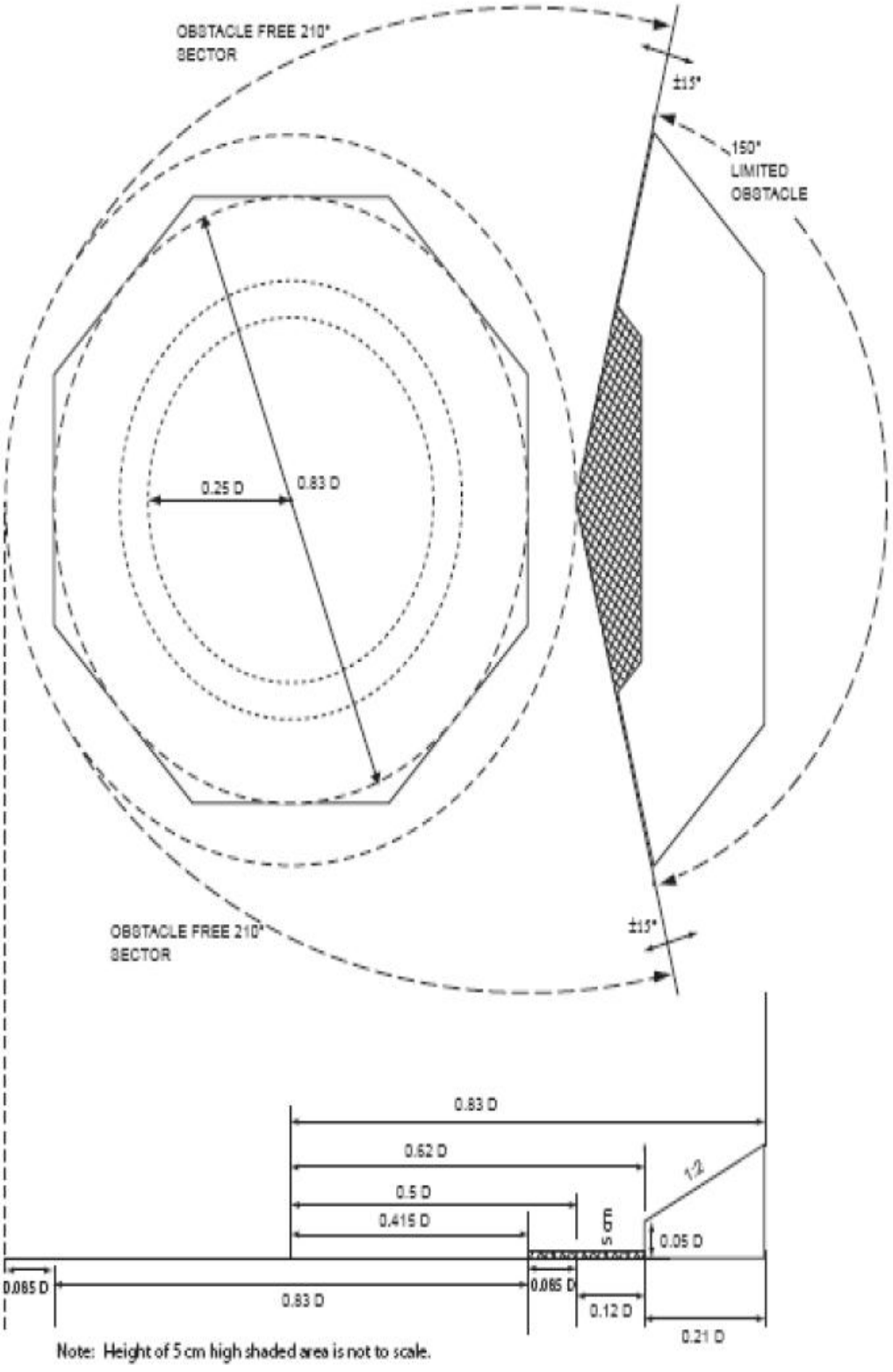


Figure 4-9. Helideck obstacle limitation sectors and surfaces for a 0.83D FATO/TLOF

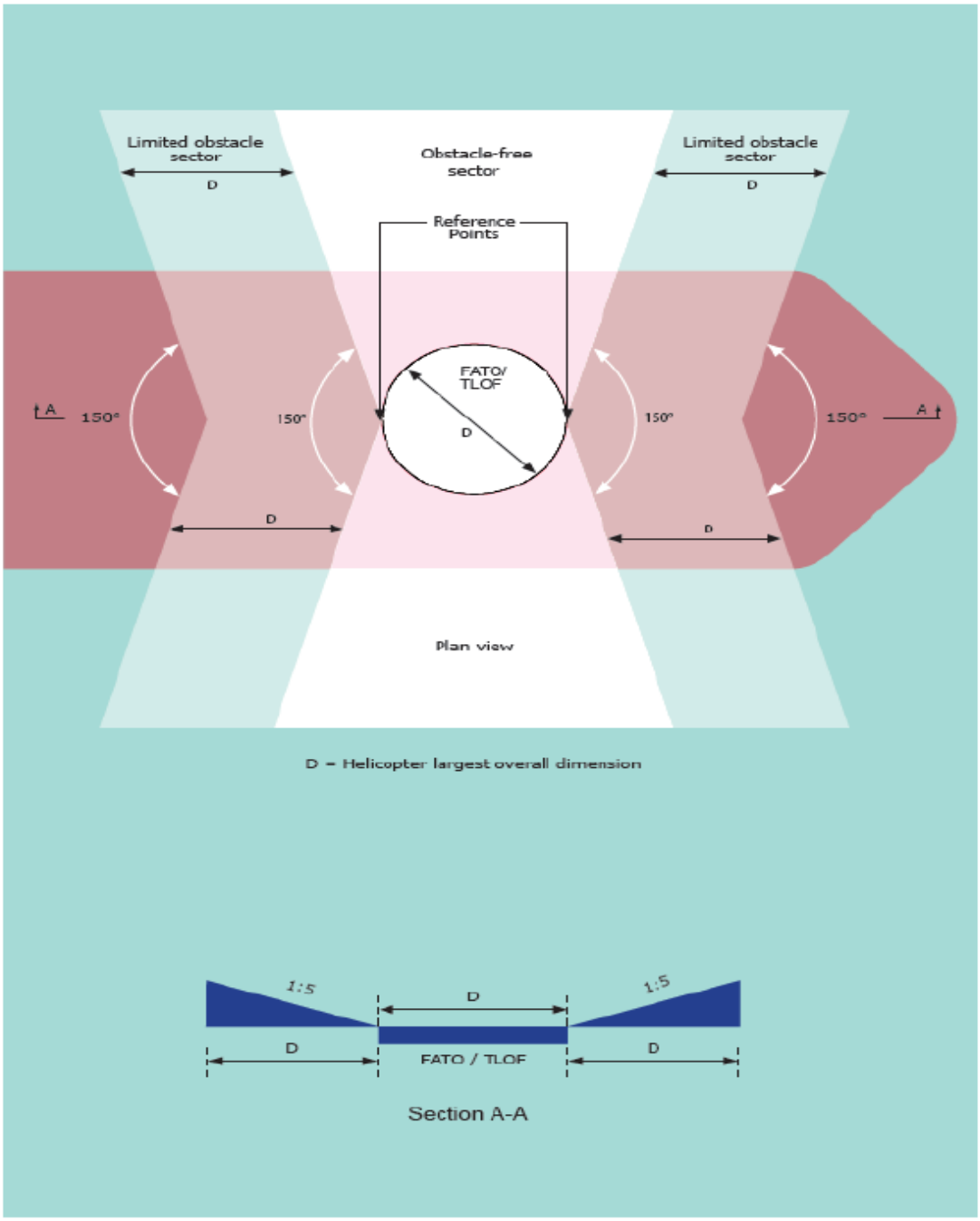


Figure 4-10. Amidships Location – Shipboard Heliport Obstacle Limitation Surfaces

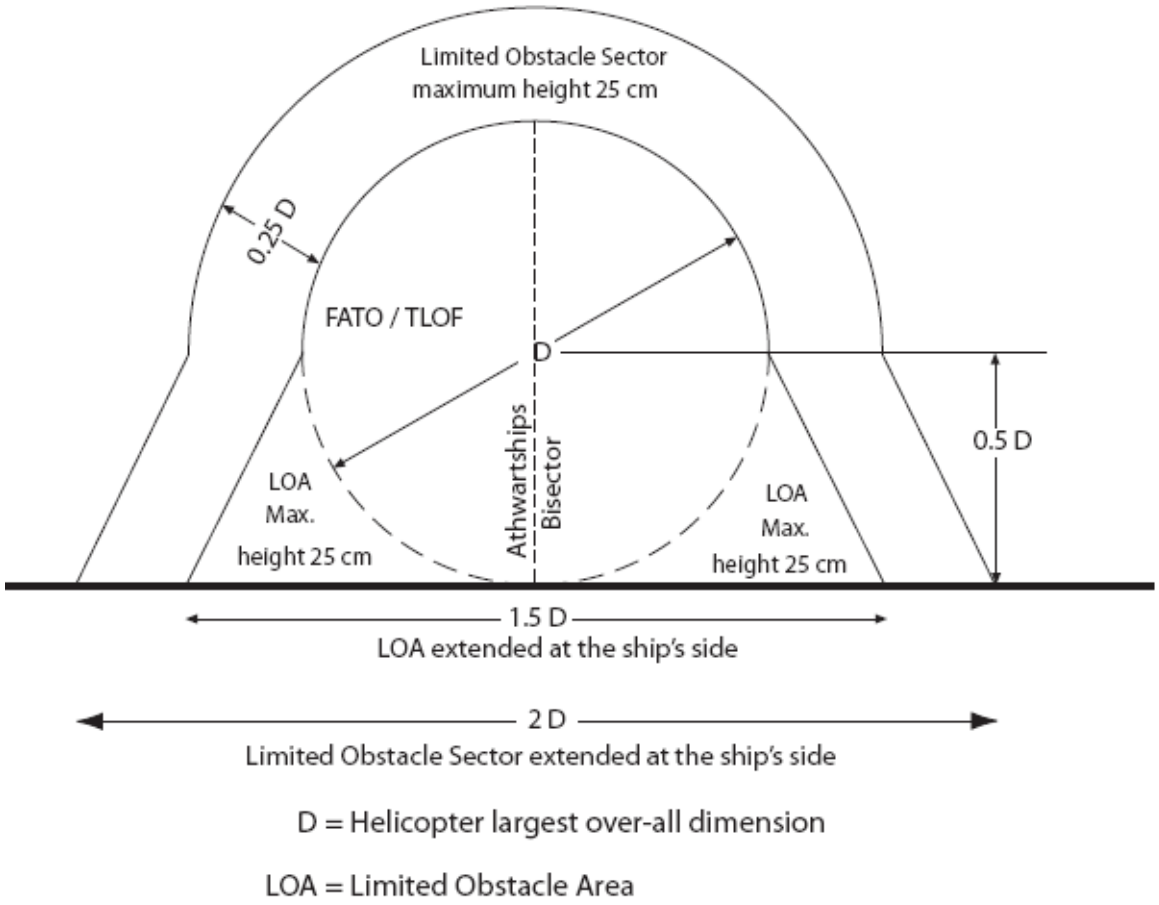


Figure 4-11. Ships-side non-purpose built heliport obstacle limitation sectors and surfaces

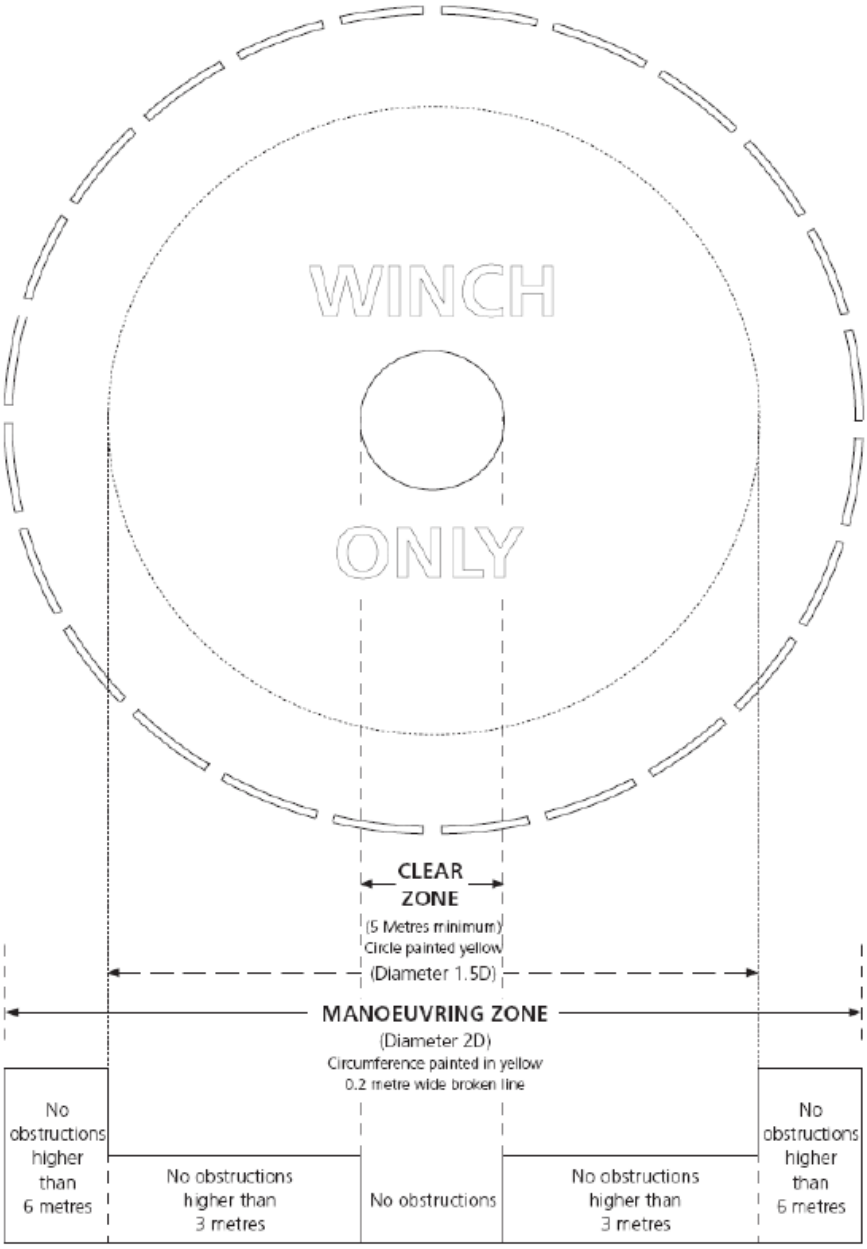
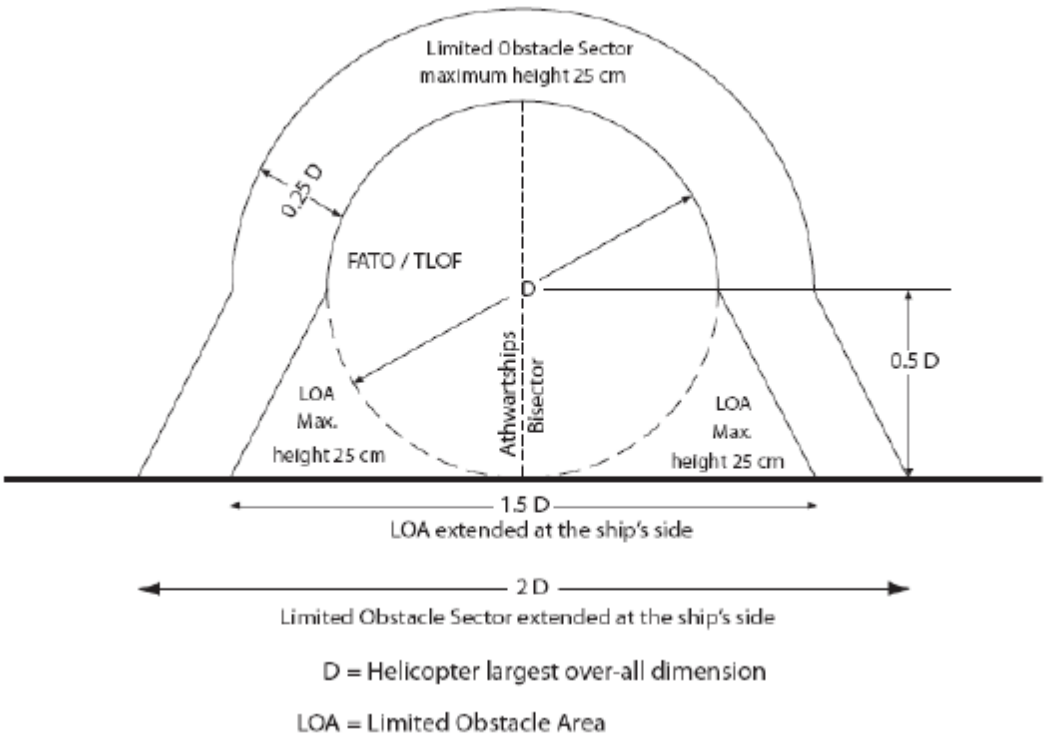


Figure 4-12. Winching area of a ship



D = Helicopter largest over-all dimension

LOA = Limited Obstacle Area

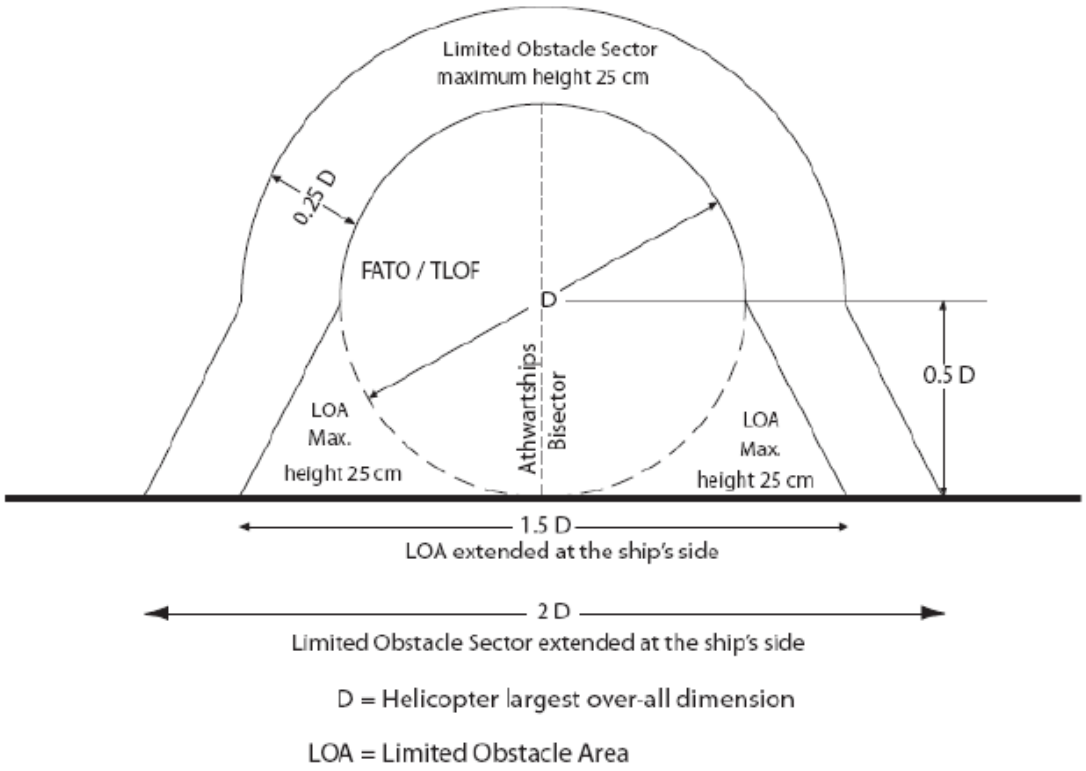


Figure 4.112A Non-purpose-Built Landing Area: Ship's Side Location – Obstacle Limitation Surfaces

TABLE 4-1
Dimensions and slopes of obstacle limitation surfaces
For All Visual FATOs including FATO/TLOFs

	SLOPE CATEGORIES		
	A	B	C
SURFACE and DIMENSIONS			
APPROACH and TAKE-OFF CLIMB SURFACE:			
Length of inner edge	Width of safety area	Width of safety area	Width of safety area
Location of inner edge	Safety area boundary (Clearway boundary if provided)	Safety area boundary	Safety area boundary
Divergence: (1st & 2nd section)			
Day use only	10%	10%	10%
Night use	15%	15%	15%
First Section:			
Length	(a)	245 m	1220 m
Slope	4.5% (1:22.2)	8% (1:12.5)	12.5% (1:8)
Outer Width	(c)	N/A	(c)
Second Section:			
Length	N/A	830 m	N/A
Slope	N/A	16% (1:6.25)	N/A
Outer Width	N/A	(c)	N/A
Total Length from inner edge (b)	(a)	1075 m	1220 m
Transitional Surface:(FATOs including FATO/TLOFs with a PinS approach procedure with a VSS)			
Slope	50% (1:2)	50% (1:2)	50% (1:2)
Height	45 m	45 m	45 m

(a) Determined by the distance from the inner edge to where the surface reaches a height of 152 m above the elevation of the inner edge. On level ground, this would typically be 3386 m (2.1 SM) in length.

(b) The approach and take-off climb surface lengths of 3386 m, 1075 m and 1220 m associated with the respective slopes, brings the helicopter to 152 m (500 ft) above FATO (or FATO/TLOF) elevation. This is typically the transition elevation between non-instrument and instrument flight.

(c) Seven rotor diameters overall width for day operations or 10 rotor diameters overall width for night operations.

Note.– The slope categories in Table 4-1 may not be restricted to a specific performance class of operation and may be applicable to more than one performance class of operation. The slope categories depicted in Table 4-1 represent minimum design slope angles and not operational slopes. Slope category ―A‖ generally corresponds with helicopters operated in performance class 1; slope category ―B‖ generally corresponds with helicopters operated in performance class 3; and slope category ―C‖ generally corresponds with helicopters operated in performance class 2. Consultation with helicopter operators will help to determine the appropriate slope category to apply according to the heliport environment and the most critical helicopter type for which the heliport is intended.

Table 4-1. Dimensions and slopes of obstacle limitation surfaces

NON-INSTRUMENT AND NON-PRECISION FATO

Surface and dimensions		Non-instrument (visual) FATO			Non-precision (instrument approach) FATO
		Helicopter performance class			
		1	2	3	
APPROACH SURFACE					
Width of inner edge			Width of safety area		Width of safety area
Location of inner edge			Boundary		Boundary
First section					
Divergence	— day	10%	10%	10%	16%
	— night	15%	15%	15%	
Length	— day	245 m[a]	245 m[a]	245 m[a]	2 500 m
	— night	245 m[a]	245 m[a]	245 m[a]	
Outer width	— day	49 m[b]	49 m[b]	49 m[b]	890 m
	— night	73.5 m[b]	73.5 m[b]	73.5 m[b]	
Slope (maximum)		8%[a]	8%[a]	8%[a]	3.33%
Second section					
Divergence	— day	10%	10%	10%	—
	— night	15%	15%	15%	
Length	— day	c	c	c	—
	— night	c	c	c	
Outer width	— day	d	d	d	—
	— night	d	d	d	
Slope (maximum)		12.5%	12.5%	12.5%	—
Third section					
Divergence		parallel	parallel	parallel	—
Length	— day	e	e	e	—
	— night	e	e	e	
Outer width	— day	d	d	d	—
	— night	d	d	d	
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

a. Slope and length enables helicopters to decelerate for landing while observing "avoid" areas.
b. The width of the inner edge shall be added to this dimension.
c. Determined by the distance from the inner edge to the point where the divergence produces a width of 7 rotor diameters for day operations or 10 rotor diameters for night operations.
d. Seven rotor diameters over-all width for day operations or 10 rotor diameters over-all width for night operations.
e. Determined by the distance from inner edge to where the approach surface reaches a height of 150 m above the elevation of the inner edge.

Table 4-2. Dimensions and slopes of obstacle limitation surfaces

INSTRUMENT (PRECISION APPROACH) FATO

	3° approach				6° approach			
	Height above FATO				Height above FATO			
Surface and dimensions	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 SURFACE								
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	60m
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 above FATO	962 m	671 m	526 m	380 m	521 m	380 m	307.5 m	235 m
Divergence to parallel section	15%	15%	15%	15%	15%	15%	15%	15%
Distance to 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
Width of parallel section	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m
Distance to 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% (1:40)	2.5% (1:40)	2.5% (1:40)	2.5% (1:40)	5% (1:20)	5% (1:20)	5% (1:20)	5% (1:20)
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% (1:33.3)	3% (1:33.3)	3% (1:33.3)	3% (1:33.3)	6% (1:16.66)	6% (1:16.66)	6% (1:16.66)	6% (1:16.66)
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

Table 4-3. Dimensions and slopes of obstacle limitation surfaces

STRAIGHT TAKE-OFF

Surface and dimensions		Non-instrument (visual) Helicopter performance class 1	2	3	Instrument
TAKE-OFF CLIMB					
Width of inner edge Location of inner edge			Width of safety area Boundary or end of clearway		90 m Boundary or end of clearway
First section					
Divergence	— day — night	10% 15%	10% 15%	10% 15%	30%
Length	— day — night	[a] [a]	245 m[b] 245 m[b]	245 m[b] 245 m[b]	2 850 m
Outer width	— day — night	[c] [c]	49 m[d] 73.5 m[d]	49 m[d] 73.5 m[d]	1 800 m
Slope (maximum)		4.5%*	8%[b]	8%[b]	3.5%
Second section					
Divergence	— day — night	parallel parallel	10% 15%	10% 15%	parallel
Length	— day — night	[e] [e]	[a] [a]	[a] [a]	1 510 m
Outer width	— day — night	[c] [c]	[c] [c]	[c] [c]	1 800 m
Slope (maximum)		4.5%*	15%	15%	3.5%*
Third section					
Divergence		—	parallel	parallel	parallel
Length	— day — night	— —	[e] [e]	[e] [e]	7 640 m
Outer width	— day — night	— —	[c] [c]	[c] [c]	1 800 m
Slope (maximum)		—	15%	15%	2%

a. Determined by the distance from the inner edge to the point where the divergence produces a width of 7 rotor diameters for day operations or 10 rotor diameters for night operations.
b. Slope and length provides helicopters with an area to accelerate and climb while observing "avoid" areas.
c. Seven rotor diameters over-all width for day operations or 10 rotor diameters over-all width for night operations.
d. The width of the inner edge shall be added to this dimension.
e. Determined by the distance from the inner edge to where the 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.

Table 4-4. 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 centre line	Not less than 270 m.
Distance to inner gate*	(a) For performance class 1 helicopters — not less than 305 m from the end of the safety area or helicopter clearway. (b) For performance class 2 and 3 helicopters — not less than 370 m from the end of the FATO.
Width of inner gate — day	Width of the inner edge plus 20% of distance to inner gate.
— night	Width of the inner edge plus 30% of distance to inner gate.
Width of outer gate — day	Width of inner edge plus 20% of distance to inner gate out to minimum width of 7 rotor diameters.
— night	Width of inner edge plus 30% of distance to inner gate out to a 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).
Slopes	As given in Tables 4-1 and 4-3.
Divergence	As given in Tables 4-1 and 4-3.
Total length of area	As given in Tables 4-1 and 4-3.

* 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 will normally be the maximum width of the area.

CHAPTER 5 – VISUAL AIDS

Note 1.— The procedures used by some helicopters require that they utilise a FATO having characteristics similar in shape to a runway for fixed wing aircraft. For the purpose of this chapter a FATO having characteristics similar in shape to a runway is considered as satisfying the concept for a "runway-type FATO". For such arrangements it is sometimes necessary to provide specific markings to enable a pilot to distinguish a runway-type FATO during an approach. Appropriate markings are contained within sub-sections entitled "Runway-type FATOs". The requirements applicable to all other types of FATOs are given within sub-sections entitled "All FATOs except runway-type FATOs".

Note 2.— It has been found that, on surfaces of light colour, the conspicuity of white and yellow markings can be improved by outlining them in black.

Note 3.— Guidance is given in the Heliport Manual (doc. 9261**)** on marking the maximum allowable mass (5.2.3), the D-value (5.2.4) and, if required, the actual FATO Dimension(s) (5.2.5) on the heliport surface to avoid confusion between markings where metric units are used and markings where imperial units are used.

Note 4.— For a non-purpose built heliport located on a ship's side the surface colour of the main deck can vary from ship to ship and therefore some discretion may need to be exercised in the colour selection of heliport paint schemes; the objective being to ensure that the markings are conspicuous against the surface of the ship and the operating background.

5.1 Indicators

5.1.1 Wind direction indicators

Application

5.1 .l. 1 A heliport shall be equipped with at least one wind direction indicator.

Location

5.1.1.2 A wind direction indicator shall be located so as to indicate the wind conditions over the FATO and TLOF 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.

5.1.1.3 Where TLOF and/or FATO may be subject to a disturbed air flow, then additional wind direction indicators located close to the area should be provided to indicate the surface wind on the area.

Note — Guidance on the location of wind direction indicators is given in the Heliport Manual (Doc 9261).

Characteristics

5.1.1.4 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.

5.1.1.5 An indicator should be a truncated cone made of lightweight fabric and should have the following minimum dimensions:

	Surface level heliport	Elevated heliports and helidecks
Length	2.4 m	1.2 m
Diameter (larger end)	0.6 m	0.3 m
Diameter (smaller	0.3 m	0.15 m

5.1.1.6. The colour of the wind direction indicator should be so selected as to make it clearly visible and understandable from a height of at least 200 m (650 ft) above the heliport, having regard to background. Where practicable, a single colour, preferably white or orange, should be used. Where a combination of two colours is required to give adequate conspicuity against changing backgrounds, they should preferably be orange and white, red and white, or black and white, and should be arranged in five alternate bands the first and last band being the darker colour.

5.1.1 7 A wind direction indicator at a heliport intended for use at night shall be illuminated.

5.2 Markings and markers

Note — See Section 14, Volume I, 5.2.1.4, Note 1, concerning improving conspicuity of markings. .

5.2.1 Winching area marking

Application

5.2.1.1 Winching area markings shall be provided at a designated winching area (see Figure 4-12).

Location

5.2.1.2 Winching area markings shall be located so that their centre coincides with the centers of the clear zone of the winching area (see Figure 4-12).

Characteristics

5.2.1.3 Winching area markings shall comprise of a winching area clear zone marking and a winching area manoeuvring zone marking.

5.2.1.4 A winching area clear zone marking shall consist of a solid circle of diameter not less than 5 m and of a conspicuous colour.

5.2.1.5 A winching area maneuvering zone marking

shall consist of a broken circle line of 30cm in width and of a diameter not less than 2 D and be marked in a conspicuous colour. Within it "WINCH ONLY" shall be marked to be easily visible to the pilot.

5.2.2 Heliport identification marking

Application

5.2.2.1 Heliport identification markings shall be provided at a heliport.

Location - All FATOs except runway-type FATOs

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

Note 1.- If the Touchdown/positioning marking is offset on a helideck, the heliport identification marking is established in the centre of the Touchdown/positioning marking.

Note 2.- On a FATO, which does not contain a TLOF and which is marked with an aiming point marking (see 5.2.8), except for a heliport at a hospital, the heliport identification marking is established in the centre of the aiming point marking as shown in Figure 5-1.

5.2.2.3 On a FATO which contains a TLOF, a heliport identification marking shall be located in the FATO so the position of it coincides with the centre of the TLOF.

Location - Runway-type FATOs

5.2.2.4 A heliport identification marking shall be located in the FATO and when used in conjunction with FATO designation markings, shall be displayed at each end of the FATO as shown in Figure 5-2.

Characteristics

5.2.2.5 A heliport identification marking, except for a heliport at a hospital, shall consist of a letter H, white in colour. The dimensions of the H marking shall be no less than those shown in Figure 5-2 and where the marking is used for a runway-type FATO its dimensions shall be increased by a factor of 3 as shown in Figure 5-3.

5.2.2.6 A heliport identification marking for a heliport at a hospital shall consist of a letter H, WHITE in colour, on a RED CRESCENT made of squares adjacent to each of the sides of a square containing the H as shown in Figure 5-2.

5.2.2.7 A heliport identification marking shall be oriented with the cross arm of the H at right angles to the preferred final approach direction. For a helideck the cross arm shall be on or parallel to the bisector of the obstacle-free sector For a non-purpose built shipboard heliport located on a ship's side the cross arm shall be parallel with the side of the ship.

5.2.2.8 On a helideck and shipboard heliport the size of the heliport identification H marking should have a height of 4 m with an overall width not exceeding 3 m and a stroke width not exceeding 0.75 m.

5.2.3 Maximum allowable mass marking

Application

5.2.3.1 A maximum allowable mass be advantageous to increase the height of the marking to 4 m marking shall be displayed at an elevated heliport, a Helideck and a shipboard heliport

5.2.3.2 A maximum allowable mass marking should be displayed at a surface level heliport.

Location

5.2.3.3 A maximum allowable mass marking should be located within FATO or TLOFand so arranged as to be readable from the preferred final approach direction.

Characteristics

5.2.3.4 A maximum allowable mass marking shall consist of a one, two-or a three-digit number.

5.2.3.5 The maximum allowable mass shall be expressed in tonnes (1,000 kg) rounded to the nearest 1000 kg followed by a letter "t". Where States use mass in pounds, the maximum allowable mass marking shall indicate the allowable helicopter mass in thousands of pounds rounded to the nearest 1000 lbs.

Note.—Where States express the maximum allowable mass in pounds it is not appropriate to suffix with the letter "t" which is used only to indicate metric tonnes. Guidance on markings where States use imperial units is given in the Heliport Manual.

5.2.3.6 The maximum allowable mass should be expressed to the nearest 100 kg. The marking should be presented to one decimal place and rounded to the nearest 100 kg followed by the letter "t". Where States use mass in pounds, the maximum allowable mass marking should indicate the allowable helicopter mass in hundreds of pounds rounded to the nearest 100 lbs.

5.2.3.6A When the maximum allowable mass is expressed to 100 kg, the decimal place should be preceded with a decimal point marked with a 30 cm square.

All FATOs except runway-type FATOs

5.2.3.7 The numbers and the letter of the marking should have a colour contrasting with the background and should be in the form and proportion shown in Figure 5-4, for a FATO with a dimension of more than 30 m. For a FATO with a dimension of between 15 m to 30m the height of the numbers and the letter of the

marking should be a minimum of 90 cm, and for a FATO with a dimension of less than 15 m the height of the numbers and the letter of the marking should be a minimum of 60 cm, each with a corresponding reduction in width and thickness.

Runway-type FATOs

5.2.3.8 The numbers and the letter of the marking should have a colour contrasting with the background and should be in the form and proportion shown in Figure 5-4.

5.2.4 D-value marking

Application

All FATOs except runway-type FATOs

5.2.4.1 The D-value marking shall be displayed at a heliport designed for helicopters operated in performance Class 2 or 3, and at a helideck and at a shipboard heliport.

Runway-type FATOs

Note. —The D-value is not required to be marked on a heliport with a runway-type FATO.

5.2.4.2 The D value marking should be displayed at surface-level and elevated heliports designed for helicopters operated in performance Class 2 or 3.

Location

5.2.4.3 A D-value marking shall be located within the FATO or TLOF and so arranged as to be readable from the preferred final approach direction.

5.2.4.4 Where there is more than one approach direction, additional D-value markings should be provided such that at least one D-value marking is readable from the final approach directions. For a non-purpose built heliport located on a ship‘s side, D value markings should be provided on the perimeter of the D circle at the 2 o’clock, 10 o’clock and 12 o‘clock positions when viewed from the side of the ship facing towards the centreline.

Characteristics

5.2.4.5 The D-value marking shall be white. The D-value marking shall be rounded to the nearest whole meter or foot with 0.5 rounded down..

5.2.4.6 The numbers of the marking should have a colour contrasting with the background and should be in the form and proportion shown in Figure 5-4 for a FATO with a dimension of more than 30 m. For a FATO with a dimension of between 15 m to 30 m the height of the numbers of the marking should be a minimum of 90 cm, and for a FATO with a dimension of less than 15 m the height of the numbers of the marking should be a minimum of 60 cm, each with a corresponding reduction in width and thickness.

5.2.5 Final approach and take-off dimension(s) marking

Application

5.2.5.1 The actual dimension(s) of the FATO or intended to be used by helicopters operated in performance class 1 should be marked on the FATO.

5.2.5.2 If the actual dimension(s) of the FATO or to be used by helicopters operated in performance class 2 or 3 is less than 1D, the dimension(s) should be marked on the FATO.

Location

5.2.5.3 A FATO size marking shall be located within the FATO and so arranged as to be readable from the preferred final approach direction.

Characteristics

5.2.5.4 The dimension(s) shall be rounded to the nearest metre or foot.

Note.— If the FATO is square or rectangular both the length and width of the FATO relative to the preferred final approach direction is indicated.

All FATOs except runway-type FATOs

5.2.5.5 The numbers of the marking should have a colour contrasting with the background and should be in the form and proportion shown in Figure 5-4 for a FATO with a dimension of more than 30 m. For a FATO with a dimension between 15 m to 30 m the height of the numbers of the marking should be a minimum of 90 cm, and for a FATO with a dimension of less than 15 m the height of the numbers of the marking should be a minimum of 60 cm, each with a corresponding reduction in width and thickness.

Runway-type FATOs

5.2.5.6 The numbers of the marking should have a colour contrasting with the background and should be in the form and proportion shown in Figure 5-4.

5.2.6 Final approach and take-off area perimeter marking or markers for surface level heliports

Application

5.2.6.1 FATO perimeter marking or markers shall be provided at a surface-level heliport where the extent of the FATO is not self-evident.

Location

5.2.6.2 The FATO perimeter marking or markers

shall be located on the edge of the FATO.

Characteristics - Runway-type FATOs

5.2.6.3 The perimeter of the FATO shall be defined with markings or markers spaced at equal intervals of not more than 50 m with at least three markings or markers on each side including a marking or marker at each corner

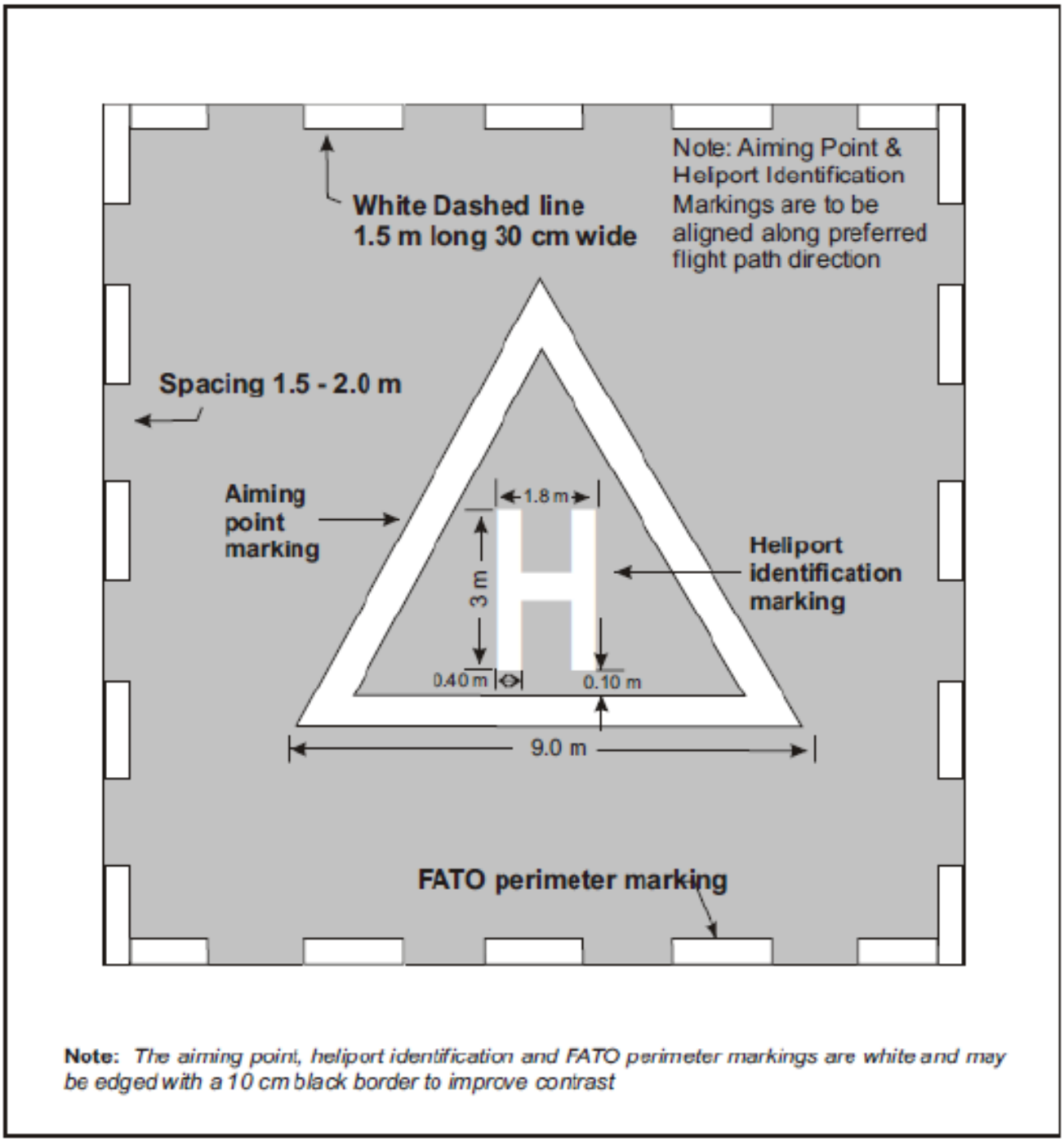


Figure 5-1. Combined heliport identification, aiming point and FATO perimeter markings

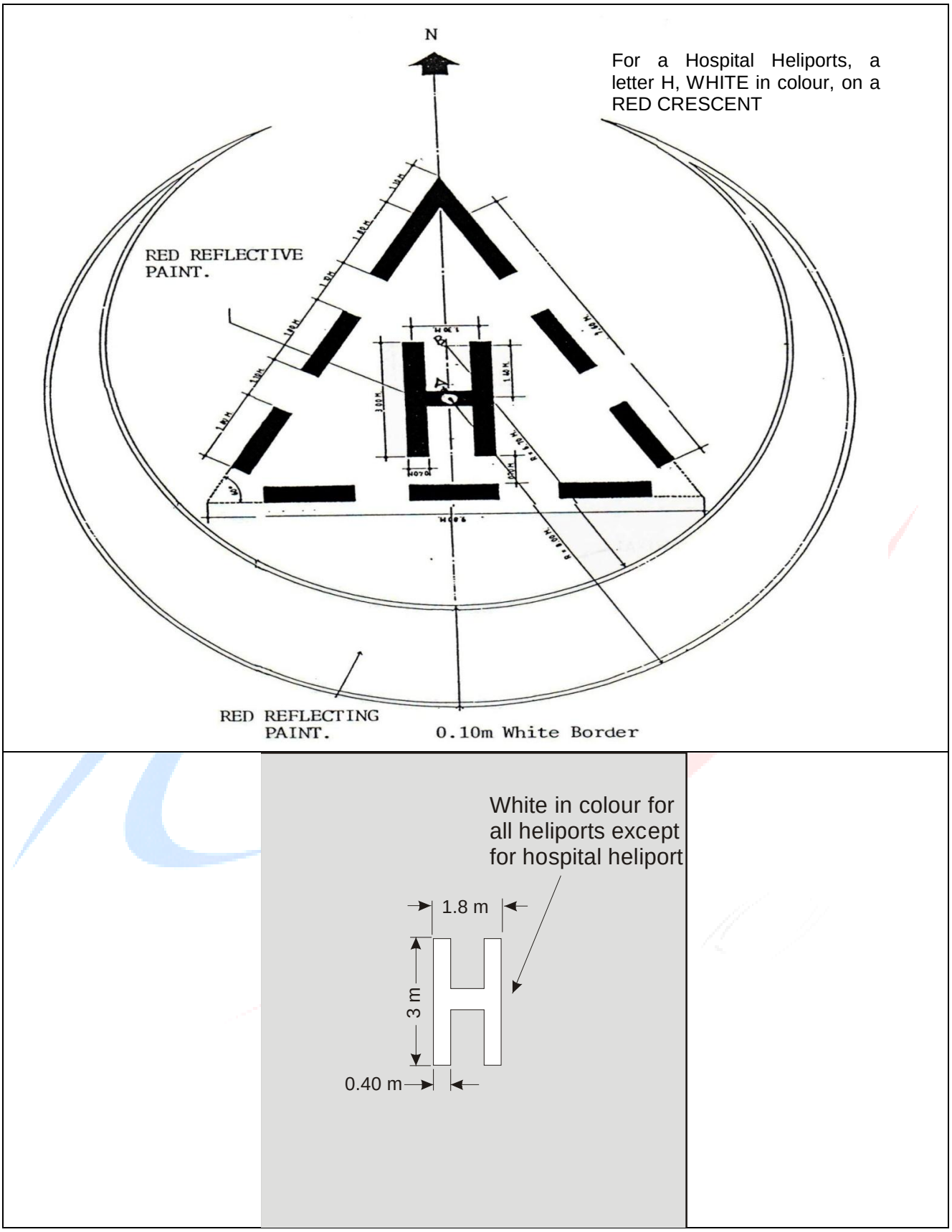


Figure 5-2 Heliport identification marking (shown with hospital Red Crescent and orientation with obstacle free section)

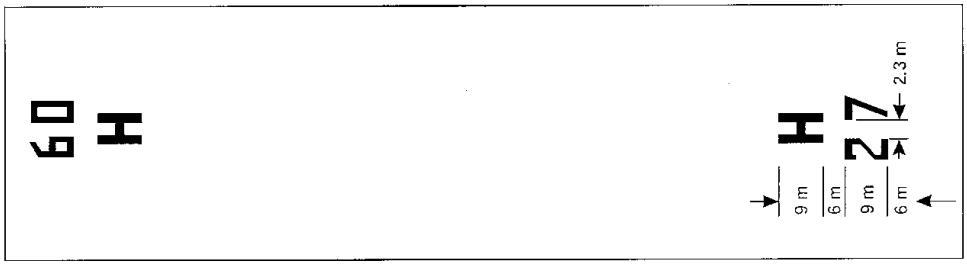


Figure 5-3. FATO designation marking and heliport identification marking for a runway-type FATO

5.2.6.4 A FATO perimeter marking shall be a rectangular stripe with a length of 9 m or one-fifth of the side of the FATO which it defines and a width of 1 m.

5.2.6.5 FATO perimeter markings shall be white.

5.2.6.6 A FATO perimeter marker shall have dimensional characteristics as shown in Figure 5-5.

5.2.6.7 FATO perimeter markers shall be of colour(s) that contrast effectively against the operating background.

5.2.6.8 FATO perimeter markers should be a single colour, orange or red, or two contrasting colours, orange and white or alternatively red and white should be used except where such colours would merge with the background.

Characteristics - All FATOs except runway-type FATOs

5.2.6.9 For an unpaved FATO the perimeter shall be defined with flush in-ground markers. The FATO perimeter markers shall be 30 cm in width, 1.5 m in length, and with end-to-end spacing of not less than 1.5 m and not more than 2 m. The corners of a square or rectangular FATO shall be defined.

5.2.6.10 For a paved FATO the perimeter shall be defined with a dashed line. The FATO perimeter marking segments shall be 30 cm in width, 1.5 m in length, and with end-to-end spacing of not less than 1.5m and not more than 2 m. The corners of the square or rectangular FATO shall be defined.

5.2.6.11 FATO perimeter markings and flush in-ground markers shall be white.

5.2.7 Final approach and take-off area designation markings for runway-type FATOs

Application

5.2.7.1 A final approach and takeoff area designation marking should be provided at a heliport where it is necessary to designate the final approach and take-off area to the pilot

Location

5.2.7.2 A final approach and take-off area designation marking shall be located at the beginning of the final approach and take-off area as shown in Figure 5-2.

Characteristics

5.2.7.3 A final approach and take-off area designation marking shall consist of a two-digit number. The two-digit number shall be the whole number nearest the one-tenth of the magnetic North when viewed from the direction of approach. When the above rule would give a single digit number, it shall be preceded by a zero. The marking as shown in Figure 5-2, shall be supplemented by the heliport identification marking.

5.2.8 Aiming point marking

Application

5.2.8.1 An aiming point marking should be provided at a heliport where it is necessary for a pilot to make an approach to a particular point above a FATO before proceeding to a touchdown and lift-off area.

Location - Runway-type FATOs

5.2.8.2 The aiming point marking shall be located within the final approach and take-off area

Location - All FATOs except runway-type FATOs

5.2.8.3 The aiming point marking shall be located at the centre of the FATO as shown in Figure 5-1.

Characteristics

5.2.8.4 The aiming point marking shall be an equilateral triangle with the bisector of one of the angles aligned with the preferred approach direction. The marking shall consist of continuous white lines and the dimensions of the marking shall conform to those shown in Figure 5-6.

5.2.9 Touchdown and lift-off area perimeter marking

Application

5.2.9.1 A TLOF perimeter marking shall be displayed on a TLOF located in a FATO at a surface level heliport if the perimeter of the TLOF is not self-evident.

5.2.9.2 A TLOF perimeter marking shall be displayed on an elevated heliport, a helideck and a shipboard heliport.

5.2.9.3 A TLOF perimeter marking should be provided on each TLOF collocated with a helicopter stand at a surface level heliport.

Location

5.2.9.4 The TLOF perimeter marking shall be located along the edge of the TLOF or FATO/TLOF.

5.2.9.5 A TLOF perimeter marking shall consist of a continuous white line with a width of at least 30 cm.

5.2.10 Touchdown/Positioning marking

Application

5.2.10.1 A touchdown/positioning marking shall be provided where it is necessary for a helicopter to touch down and/or be accurately positioned by the pilot. A touchdown/positioning marking shall be provided on a helicopter stand designed for turning.

Location

5.2. 10. 2 A touchdown/positioning marking shall be located so that when the pilot's seat is over the marking, the whole of the undercarriage will be within TLOF and all parts of the helicopter will be clear of any obstacle by a safe margin.

5.2.10.3 On a heliport the centre of the touchdown/positioning marking shall be located at the centre of the TLOF, except the centre of the touchdown/positioning marking may be offset away from the centre of the TLOF where an aeronautical study indicates such offsetting to be necessary and providing that a marking so offset would not adversely affect safety. For a helicopter stand designed for hover turning, the touchdown/positioning marking shall be located in the centre of the central zone (see Figure 3-4).

5.2. 10.4 On a helideck the centre of the touchdown marking shall be located at the centre of the touchdown and lift-off area, except that the marking may be offset away from the origin of the obstacle-free sector by no more than 0.1 D where an aeronautical study indicates such offsetting to be necessary and providing that a marking so offset would not adversely affect safety.

Note. See Heliport Manual (Doc 9261) for guidance.

Characteristics

5.2. 10.5 A touchdown/positioning marking shall be a yellow circle and have a line width of at least 0.5 m. For a helideck and a purpose built shipboard heliport, the line width shall be at least 1 m.

5.2. 10.6 The inner diameter of the touchdown/positioning marking shall be half the 0.5 D value of the largest helicopter the TLOF and/or the helicopter stand is intended to serve.

5.2.11 Heliport name marking

Application

5.2.11.1 A heliport name marking should be provided at a heliport and a helideck where there is insufficient alternative means of visual identification.

Location

5.2. 11.2 The heliport name marking should be displayed on the heliport so as to be visible, as far as practicable, at all angles above the horizontal. Where an obstacle sector exists on a helideck the marking should be located on the obstacle side of the heliport identification marking. For a non-purpose built heliport located on a ship's side the marking should be located on the inboard side of the heliport identification marking in the area between the continuous line TLOF perimeter marking and the broken line indicating the boundary of the LOS.

Characteristics

5.2. 11.3 A heliport name marking shall consist of the name or the alphanumeric designator of the heliport as used in the radio (R/T) communications.

5.2. 11.4 A heliport name marking intended for use at night or during conditions of poor visibility should be illuminated, either internally or externally.

Runway-type FATOs

5.2. 11.5 The characters of the marking should be not less than 3 m in height

All FATOs except runway-type FATOs

5.2.11.6 The characters of the marking should be not less than 1.5 m in height at surface level heliports and not less than 1.2 m on elevated heliports, helidecks and shipboard heliports. The colour of the marking should contrast with the background and preferably be white.

5.2.12 Helideck obstacle-free sector (chevron) marking

Application

5.2.12.1 A helideck with adjacent obstacles that penetrate above the level of the helideck shall have an obstacle free sector marking.

Location

5.2.12.2 A helideck obstacle-free sector marking shall be located, where practicable, at a distance from the centre of the TLOF equal to the radius of the largest circle that can be drawn in the TLOF or 0.5D, whichever is greater.

Note.- Where the Point of Origin is outside the FATO/TLOF, and it is not practicable to physically paint the chevron, the chevron is relocated to the perimeter on the bisector of the OFS. In this case the distance and direction of displacement, along with the attention getting "WARNING DISPLACED CHEVRON", with the distance and direction of displacement, is marked in a box beneath the chevron in black characters not less than 10cm high – an example Figure is given in the Heliport Manual.

Characteristics

5.2.12.3 The helideck obstacle-free sector marking shall indicate the location of the obstacle free sector, and the directions of the limits of the sector.

Note. Example figures are given in the Heliport Manual (Doc 9261)..

5.2.12.4 The height of the chevron shall be less than 30 cm.

5.2.12.5 The chevron shall be marked in a conspicuous colour.

5.2.12.6 The colour of the Chevron should be black.

5.2.13 Helideck and shipboard heliport surface markingApplication

5.2.13.1 A surface marking should be provided to assist the pilot to identify the location of the helideck or shipboard heliport during an approach by day.

Location

5.2.13.2 A surface marking should be applied to the dynamic load bearing area bounded by the TLOF perimeter marking.

Characteristics

5.2.13.3 The helideck surface or shipboard heliport, bounded by the FATO/TLOF perimeter marking should be of dark green using a high friction coating.

Note.- Where the application of a surface coating may have a degrading effect on friction qualities it may be necessary to leave the surface unpainted. In such cases the conspicuity of markings will need to be enhanced by outlining deck markings with a contrasting colour.

5.2.14 Helideck prohibited landing sector markings

Application

5.2.14.1 Helideck prohibited landing sector markings should be provided where it is necessary to prevent the helicopter from landing within specified headings.

Location

5.2.14.2 The prohibited landing sector markings should be located on the touchdown/positioning marking to the edge of the TLOF, within the relevant headings.

Characteristics

5.2.14.3 The prohibited landing sector markings shall be indicated by white and red hatched markings as shown in Figure 5.7.

Note.- Prohibited landing sector markings, where deemed necessary, are applied to indicate a range of helicopter headings that are not to be used by a helicopter when landing. This is to ensure that the nose of the helicopter is kept clear of the hatched markings during the maneouvre to land.

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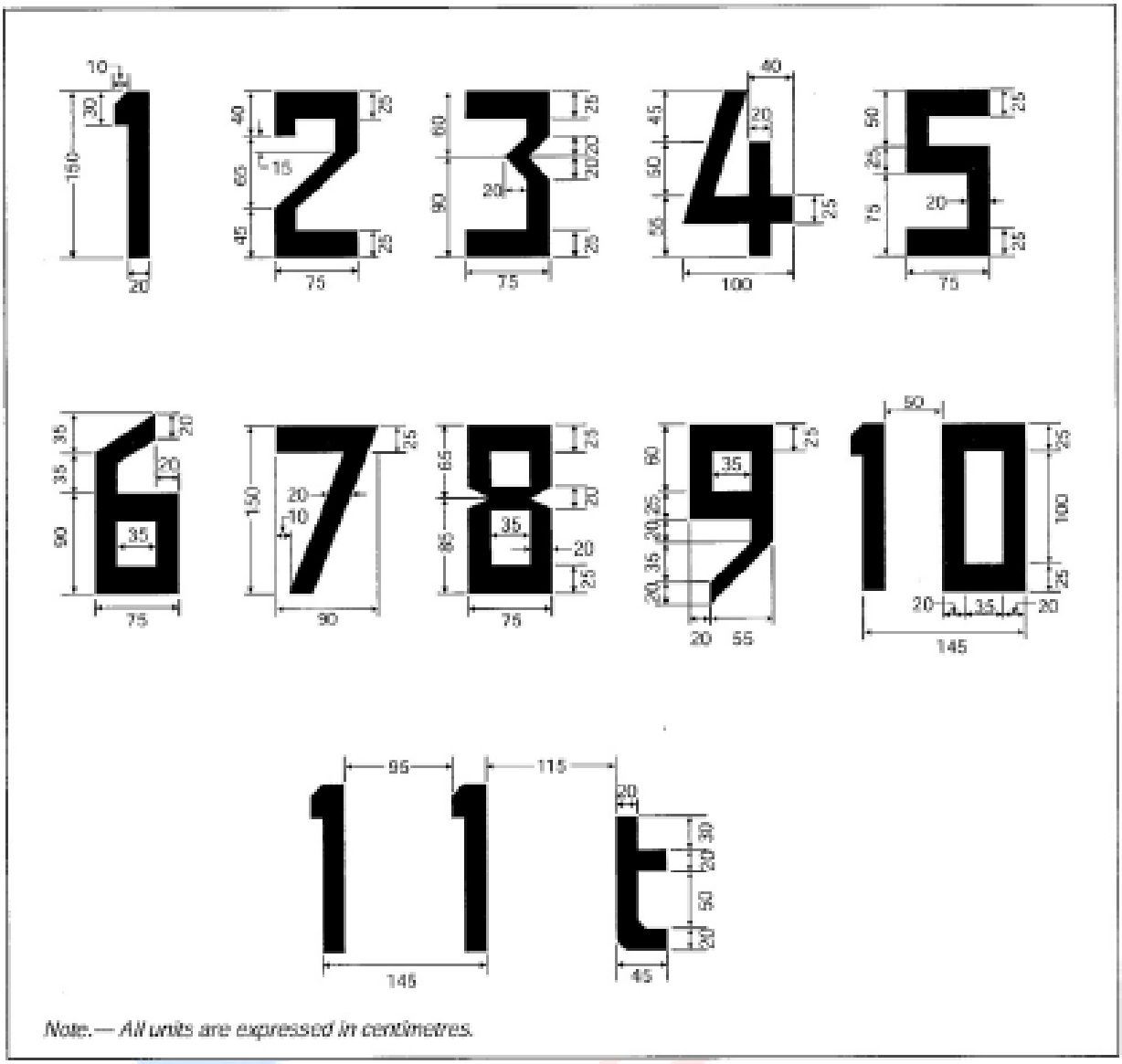

Figure 5-4. Form and proportions of numbers and letters

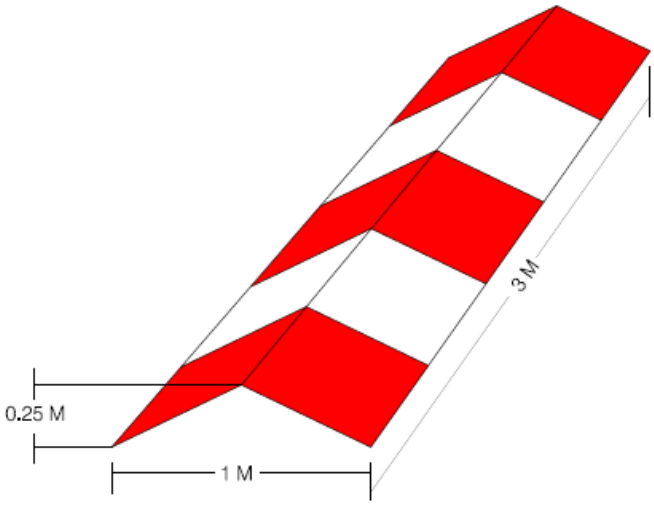

Figure 5-5 Runway-type FATO edge marker

5.2.15 **Helicopter ground taxiway markings and markers**

Note 1.— The specifications for taxi-holding position markings in Annex 14, Volume I, 5.2.10 are equally applicable to taxiways intended for ground taxiing of helicopters.

Note 2.- Ground taxi-routes are not required to be marked.

Application

5.2.15.1 The centre line of a ground taxiway should be identified with a marking and the edges of a ground taxiway, if not self evident, should be identified with markers or markings.

Location

5.2.15.2 Helicopter ground taxiway markings shall be along the centre line and, if required, along the edges of a ground taxiway.

5.2.15.3 Helicopter ground taxiway edge markers shall be located at a distance of 0.5m to 3m beyond the edge of the taxiway.

5.2.15.4 Helicopter ground taxiway edge markers, where provided, shall be spaced at intervals of not more than 15 m on each side of straight sections and 7.5 m on each side of curved sections with a minimum of four equally spaced markers per section.

Characteristics

5.2.15.5 A helicopter ground taxiway centre line marking shall be a continuous yellow line 15 cm in width.

5.2.15.6 Helicopter ground taxiway edge markings shall be a continuous double yellow line, each 15 cm in width, and spaced 15 cm apart (nearest edge to nearest edge).

Note.- Signage may be required on an aerodrome where it is necessary to indicate that a ground taxiway is suitable only for the use of helicopters.

5.2.15.7 A helicopter ground taxiway edge marker shall be frangible.

5.2.15.8 A helicopter ground taxiway edge marker shall not exceed a plane originating at a height of 25 cm above the plane of the ground taxiway, at a distance of 0.5m from the edge of the taxiway and sloping upwards and outwards at a gradient of 5 per cent to a distance of 3m beyond the edge of the ground taxiway.
5.2.15.9 A helicopter ground taxiway edge marker shall be blue.

Note 1.- Guidance on suitable edge markers is given in the Heliport Manual (Doc 9261).

Note 2.- If blue markers are used on an aerodrome, signage may be required to indicate that the ground taxiway is suitable only for helicopters.

5.2.15.10 If the helicopter ground taxiway is to be used at night, the edge markers shall be internally illuminated or retro-reflective.

5.2.16 Helicopter air taxiway marking and markers

Note. Air Taxi-routes are not required to be larked.

Application

5.2.16.1 The centre line of an air taxiway or, if not self evident, the edges of an air taxiway should be identified with markers or markings.

Location

5.2.16.2 A helicopter air taxiway centre line marking or flush in-ground centre line markers shall be located along the centre line of the air taxiway

5.2.16.3. Helicopter air taxiway edge markings shall be located along the edge of a helicopter air taxiway.

5.2.16.4 Helicopter air taxiway edge markers shall be located at a distance of 1 m to 3m beyond the edge of the air taxiway.

5.2.16.5 Helicopter air taxiway edge markers should not be located at a distance of less than 0.5 of the largest overall width of the helicopter for which designed from the centre line of the air taxiway.

Characteristics

5.2.16.6 A Helicopter air taxiway centre line, when on a paved surface, shall be marked with a continuous yellow line 15 cm in width

5.2.16.7 The edges of a helicopter air taxiway, when on a paved surface, shall be marked with continuous double yellow lines each 15 cm in width, and spaced 15 cm apart (nearest edge to nearest edge).

Note.- Where there is potential for a helicopter air taxiway to be confused with a ground taxiway, signage may be required to indicate the mode of taxi operations that are permitted.

5.2.16.8 A helicopter air taxiway centre line, when on an unpaved surface that will not accommodate painted markings, shall be marked with flush in-ground 15 cm wide and approximately 1.5 m in length yellow markers, spaced at intervals of not more than 30 m on straight sections and not more than 15 m on curves, with a minimum of four equally spaced markers per section.

5.2.16.9 Helicopter air taxiway edge markers, where provided, shall be spaced at intervals of not more than 30 m on each side of straight sections and not more than 15 m on each side of curves, with a minimum of four equally spaced markers per section.

5.2.16.10 Helicopter air taxiway edge markers shall be frangible.

5.2.16.11 Helicopter air taxiway edge markers shall not penetrate a plane originating at a height of 25 cm above the plane of the taxiway, at a distance of 1 m from the edge of the taxiway and sloping upwards and outwards at a gradient of 5 per cent to a distance of 3m beyond the edge of the air taxiway.

5.2.16.12 Helicopter air taxiway edge markers should not penetrate a plane originating at a height of 25 cm above the plane of the taxiway, at a distance of 0.5 of largest overall width of the helicopter for which designed from the centre line of the taxiway, and sloping upwards and outwards at a gradient of 5 per cent.

5.2.16.13 A helicopter air taxiway edge marker shall be of colour(s) that contrast effectively against the operating background. The colour red shall not be used for markers.

Note.- Guidance for suitable edge markers is given in the Heliport Manual (Doc 9261).

5.2.16.14 If the helicopter air taxiway is to be used at night, air taxiway edge markers shall be either internally illuminated or retro-reflective.

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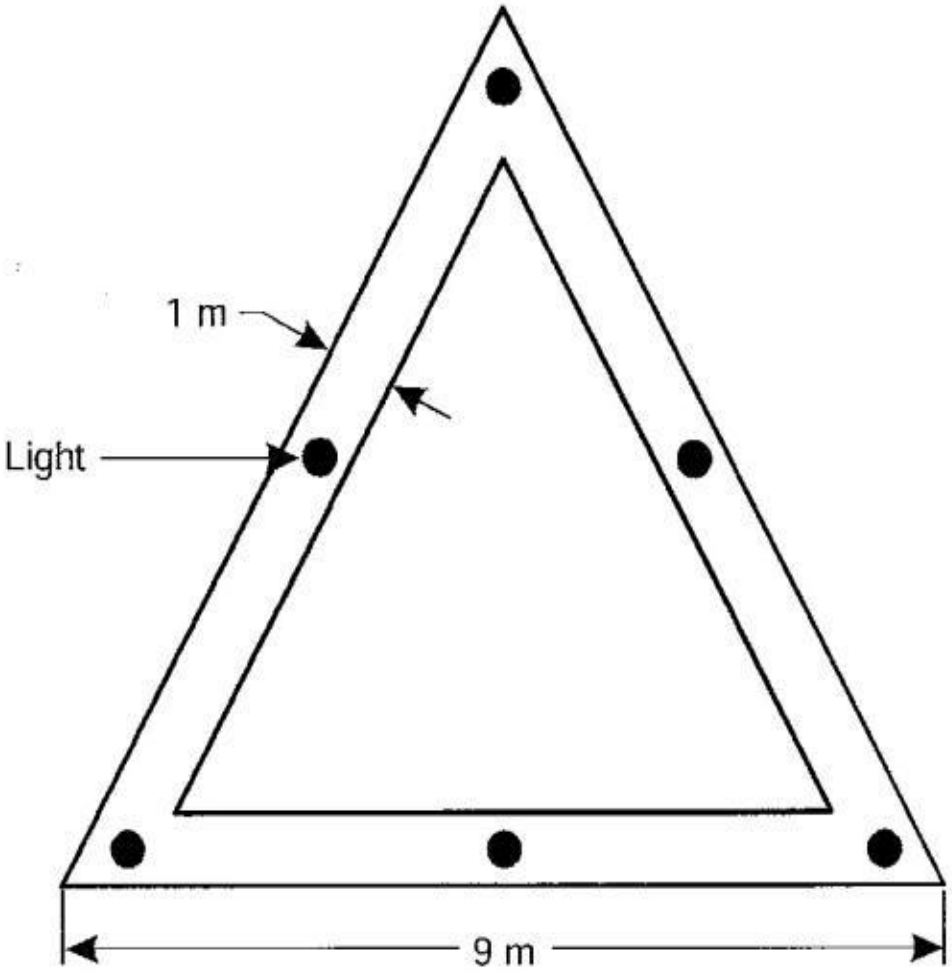


Figure 5-6. Aiming point marking

Figure 5-7 Helideck prohibited landing sector marking

5.2.17 Helicopter stand markings

Application

5.2.17.1 A helicopter stand perimeter marking shall be provided on a helicopter stand designed for turning. If a helicopter stand perimeter marking is not practicable, a central zone perimeter marking shall be provided instead if the perimeter of the central zone is not self-evident.

5.2.17.2 For a helicopter stand intended to be used for taxi-through and which does not allow the helicopter to turn, a stop line shall be provided.

5.2.17.3 Alignment lines and lead-in/lead-out lines should be provided on a helicopter stand.

Note 1.– See Figure 5-8.

Note 2.- Helicopter stand identification markings may be provided where there is a need to identify individual stands.

Note 3.- Additional markings relating to stand size may be provided. See Heliport Manual (Doc 9261).

Location

5.2.17.4 A helicopter stand perimeter marking on a helicopter stand designed for turning or, a central zone perimeter marking, shall be concentric with the central zone of the stand.

5.2.17.5 For a helicopter stand intended to be used for taxi-through and which does not allow the helicopter to turn, a stop line shall be located on the taxiway axis at right angles to the centreline.

5.2.17.6 Alignment lines and lead-in/lead-out lines shall be located as shown in Figure 5-8.

Characteristics

5.2.17.7 A helicopter stand perimeter marking shall be a yellow circle and have a line width of 15 cm.

5.2.17.8 A central zone perimeter marking shall be a yellow circle and have a line width of 15 cm, except when the TLOF is collocated with a helicopter stand, the characteristics of the TLOF perimeter markings shall apply.

5.2.17.9 For a helicopter stand intended to be used for taxi-through and which does not allow the helicopter to turn, a yellow stop line shall not be less than the width of the taxiway and have a line thickness of 50 cm.

5.2.17.10 Alignment lines and lead-in/lead-out lines shall be continuous yellow lines and have a width of 15 cm.

5.2.17.11 Curved portions of alignment lines and lead-in/lead-out lines shall have radii appropriate to the most demanding helicopter type the helicopter stand is intended to serve.

5.2.17.12. Stand identification markings shall be marked in a contrasting colour so as to be easily readable.

Note 1.- Where it is intended that helicopters proceed in one direction only, arrows indicating the direction to be followed may be added as part of the alignment lines.

Note 2.- The characteristics of markings related to the stand size, and alignment and lead-in/lead-out lines are illustrated in Figure 5-8.

5.2.18 Flight path alignment guidance marking

Application

5.2.18.1 Flight path alignment guidance marking(s) should be provided at a heliport where it is desirable and practicable to indicate available approach and/or take-off flight path direction(s).

Note.— The flight path alignment guidance marking can be combined with a flight path alignment guidance lighting system described in 5.3.3A.

Location

5.2.18.2 The flight path alignment guidance marking shall be located in a straight line along the direction of approach and/or take-off flight path on one or more of the TLOF, FATO, safety area or any suitable surface in the immediate vicinity of the FATO or safety area.

Characteristics

5.2.18.3 A flight path alignment guidance marking shall consist of one or more arrows marked on the TLOF, FATO or FATO/TLOF and/or safety area surface as shown in Figure 5-9. The stroke of the arrow(s) shall be 50 cm in width and at least 3 m in length. When combined with a flight path alignment guidance lighting system it shall take the form shown in Figure 5-9 which includes scheme for marking heads of the arrows‘ which are constant regardless of stroke length.

Note. — In the case of a flight path limited to a single approach direction or single take-off direction, the arrow marking may be uni-directional. In the case of a heliport with only a single approach /take-off flight path available, one bi-directional arrow is marked.

5.2.18.4 The markings should be in a colour which provides good contrast against the background colour of the surface on which they are marked, preferably white.

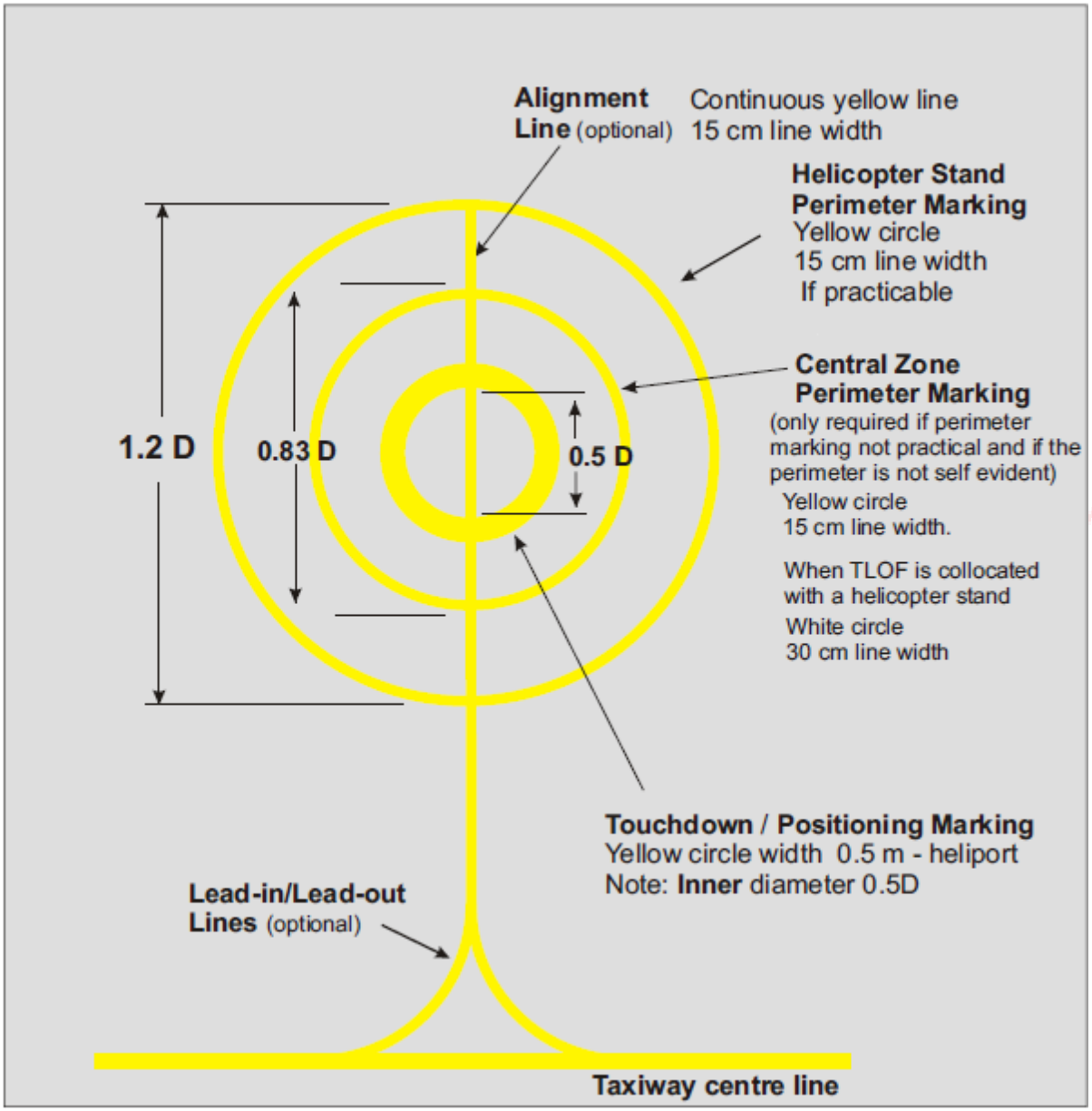


Figure 5-8 Helicopter stand designed for hover-turning markings

5.3 Lights

5.3.1 General

Note 1. — See Annex 14, Volume I, 53.1 concerning Specifications on screening of non-aeronautical ground lights. and design of elevated and inset lights.

Note 2. — In the case of helidecks and heliports located near navigable waters, consideration needs to be given to ensuring that aeronautical ground lights do not cause confusion to mariners.

Note 3. — As helicopters will generally come very close to extraneous light sources, it is particularly important to ensure that, unless such lights are navigation lights exhibited in accordance with international regulations, they are screened or located so as to avoid direct and reflected glare,

Note 4 — Specifications in sections 5.3.4, 5.3.6, 5.3.7, and 5.3.8 are designed to provide effective lighting systems based on night conditions. Where lights are to be used in conditions other than night (i.e. - day or twilight) it may be necessary to increase the intensity of the lighting to maintain effective visual cues by use of a suitable brilliancy control. Guidance is provided in the Aerodrome Design Manual (Doc 9157), Part 4 Visual Aids, Chapter 5 Light Intensity Settings.

5.3.2 Heliport beacon

Application

5.3.2.1. A heliport beacon should be provided at a heliport where:

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

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

Location

5.3.2.2 The heliport beacon shall be located on or adjacent to the heliport preferably at an elevated position and so that it does not dazzle a pilot at short range.

Note — Where a heliport beacon is likely to dazzle pilots at short range it may be switched off during the final stages of the approach and landing.

Characteristics

5.3.2.3 The heliport beacon shall emit repeated series of equispaced short duration white flashes in the format in Figure 5-8.

5.3.2.4 The light from the beacon shall show at all angles of azimuth.

5.3.2.5 The effective light intensity distribution of each flash should be as shown in Figure 5-9, illustration 1.

Note — Where brilliancy control is desired, settings of 10 percent and 3 percent have been found to be satisfactory .In addition, shielding may be necessary to ensure that pilots are not dazzled during the final stages of the approach and landing.

5.3.3 Approach lighting system

Application

5.3.3.1 An approach lighting system should be provided at a heliport where it is desirable and practicable to indicate a preferred approach direction.

5.3.3.2 The approach lighting system shall be located in a straight line along the preferred direction of approach.

Characteristics

5.3.3.3. An approach lighting system should consist of a row of three lights spaced uniformly at 30 m intervals and of a crossbar 18 m in length at a distance of 90 m from the perimeter of the final approach and take-off area as shown in Figure 5-10. The lights forming the crossbar should be as nearly as practicable in a horizontal straight line at right angles to, and bisected by, the line of the centre line lights and spaced at 4.5 m intervals. Where there is the need to make the final approach course more conspicuous additional lights spaced unformly at 30m intervals should be added beyond the crossbar. The lights beyond the crossbar may be steady or sequenced flashing, depending upon the environment.

Note — Sequenced flashing lights may be useful where

5.3.3.4 The steady lights shall be omnidirectional white lights.

5.3.3.5 Sequenced flashing lights shall be omnidirectional white lights.

5.3.3.6 The flashing lights should have a flash frequency of one per second and their light distribution should be as shown in Figure 5-9, Illustration 3. The flash sequence should commence from the outermost light and progress towards the crossbar.

5.3.3.7 A suitable brilliancy control should be incorporated to allow for adjustment of light intensity to meet the prevailing conditions.

Note — The following intensity settings have been found suitable:

a) steady lights - 100 percent, 30 percent and 10 percent and

b) flashing lights – 100 percent, 10 percent and 3 percent.

5.3.4 Flight path alignment guidance lighting system

Application

5.3.4.1 Flight path alignment guidance lighting system(s) should be provided at a heliport where it is desirable and practicable to indicate available approach and/or take-off flight path direction(s).

Note.— The flight path alignment guidance lighting can be combined with a flight path alignment guidance marking(s) described in 5.2.18.

Location

5.3.4.2 The flight path alignment guidance lighting system shall be in a straight line along the direction(s) of approach and/or take-off flight path on one or more of the TLOF, FATO safety area or any suitable surface in the immediate vicinity of the FATO, FATO/TLOF or safety area.

5.3.4.3 If combined with a flight path alignment guidance marking, as far as is practicable the lights should be located inside the _arrow' markings.

Characteristics

5.3.4.4 A flight path alignment guidance lighting system should consist of a row of three or more lights spaced uniformly a total minimun distance of 6 m. Intervals between lights should not be less than 1.5 m and should not exceed 3 m. Where space permits there should be 5 lights.See Figure 5-9.

Note.— The number of lights and spacing between these lights may be adjusted to reflect the space available. If more than one flight path alignment system is used to indicate available approach and/or take-off flight path direction(s), the characteristics for each system are typically kept the same. See Figure 5-9.

5.3.4.5 The lights shall be steady omnidirectional inset white lights.

5.3.4.6 The distribution of the lights should be as indicated in Figure 5-11, Illustration 6.

5.3.4.7 A suitable control should be incorporated to allow for adjustment of light intensity to meet the prevailing conditions and to balance the flight path alignment guidance lighting system with other heliport lights and general lighting that may be present around the heliport

5.3.5 Visual alignment guidance system

Application

5.3.5.1 A visual alignment guidance system should be provided to serve the approach to a heliport where one or more of the following conditions exist especially at night:

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

Location

5.3.5.2 The visual alignment guidance system shall be located such that a helicopter is guided along the prescribed track towards the final approach and take-off area.

5.3.5.3 The system should be located at the downwind edge of the3nal approach and takeoff area and aligned along the preferred approach direction

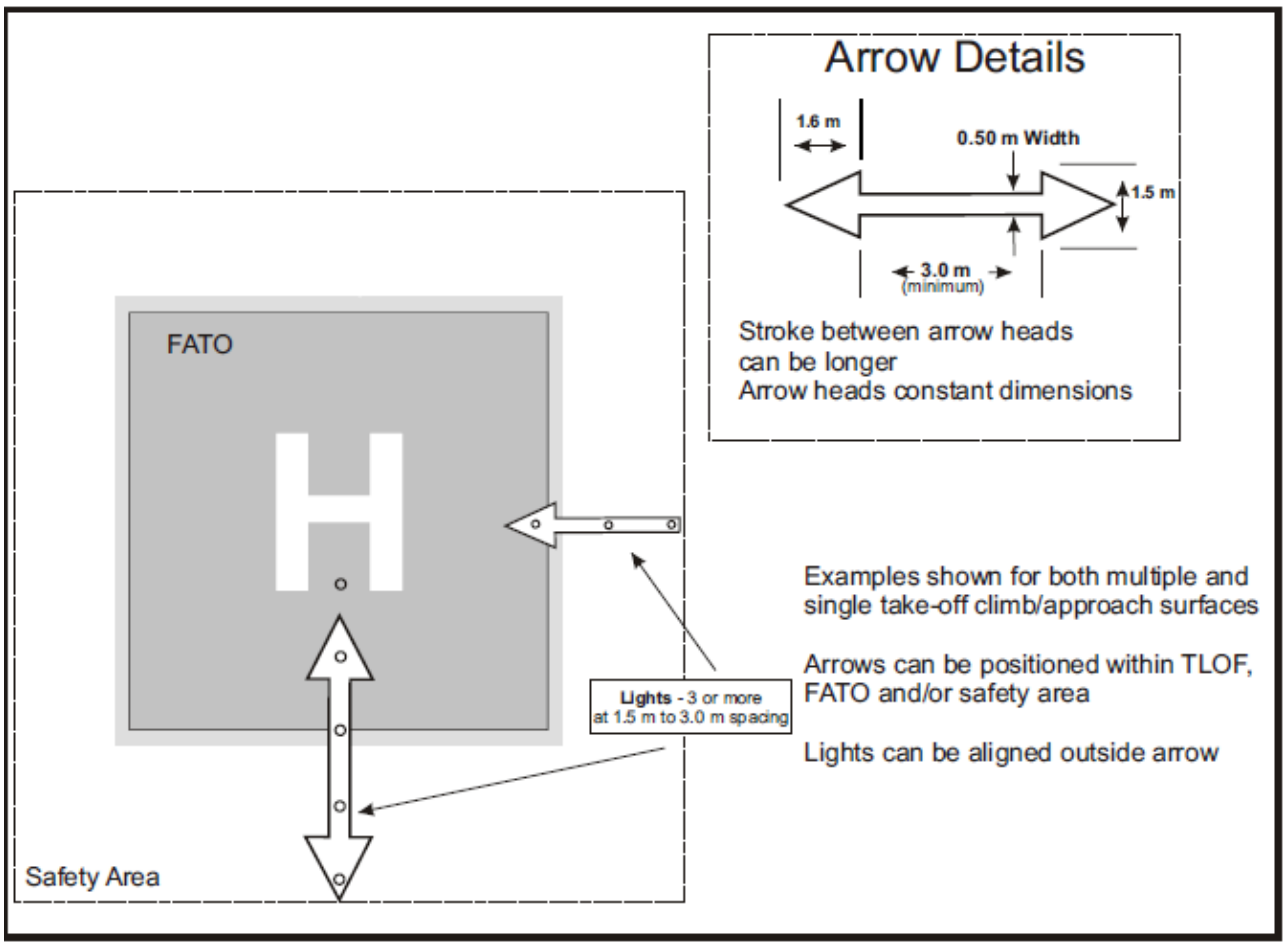


Figure 5-9 Flight path alignment guidance markings and lights

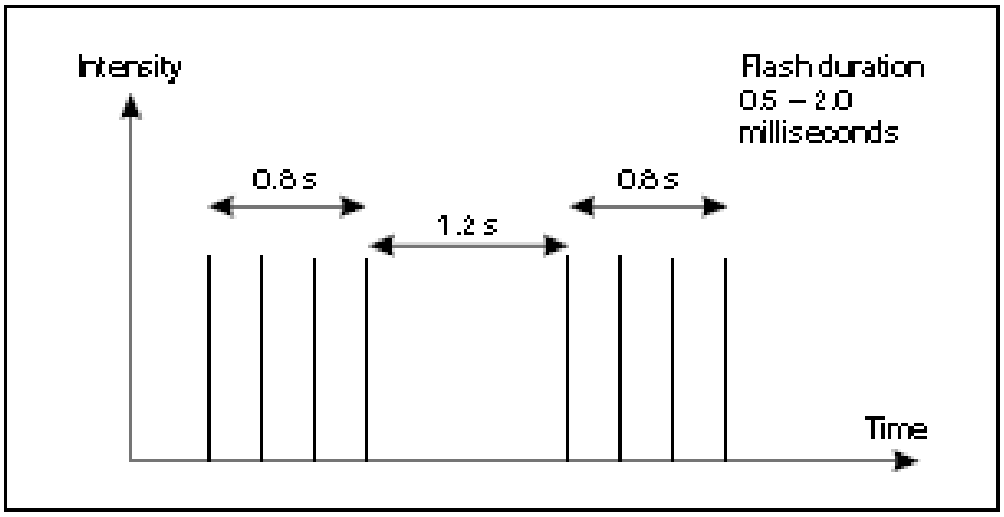
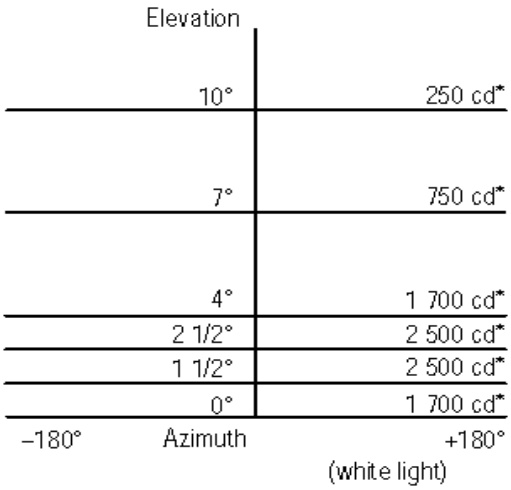


Figure 5-10 Heliport beacon flash characteristics



*Effective intensity.

Illustration 1- Helicopter beacon

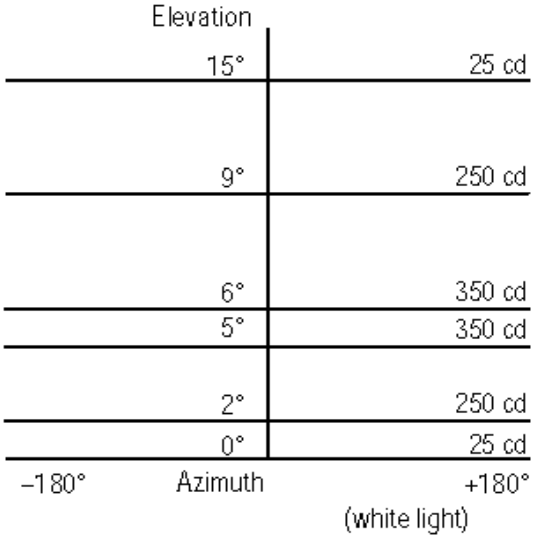
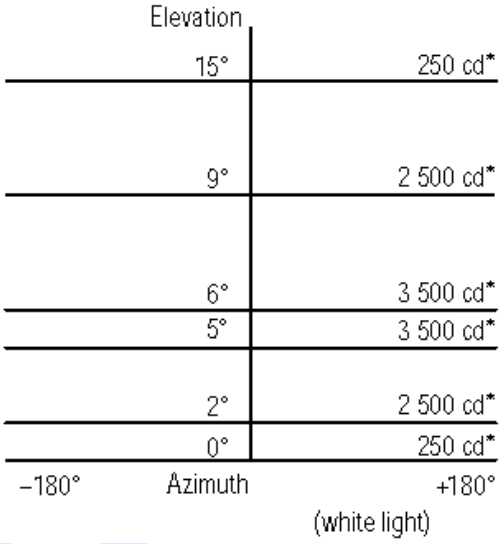


Illustration 2 – Approach light steady burning



**Effective intensity.*

Illustration 3- Approach light flashing

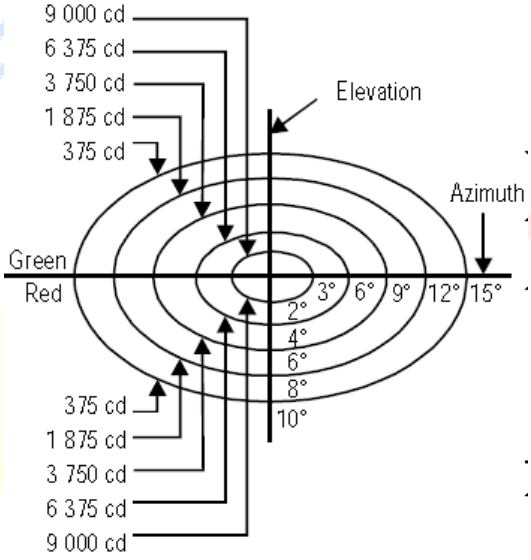


Illustration 4- HAPI system

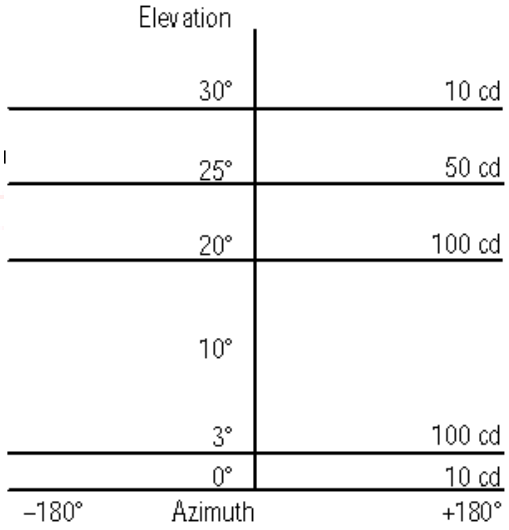
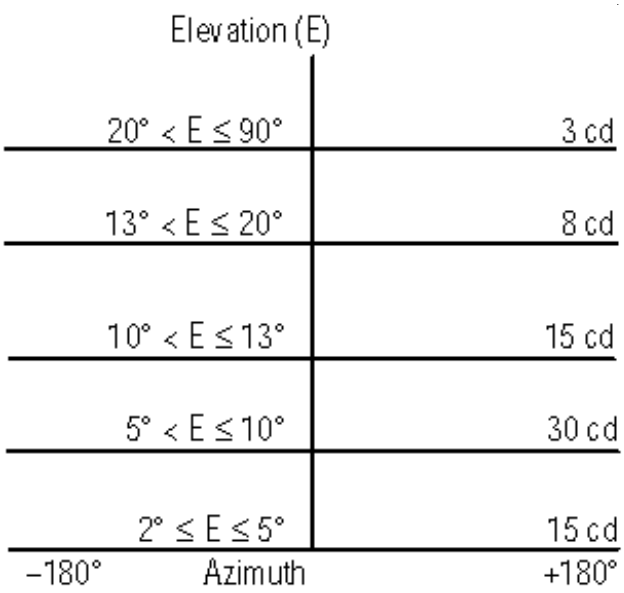


Illustration 5 – Final approach and take off area lights and aiming point lights

Figure 5-11. Isocandela diagrams *(part 1/2)*



(green or white light)

Note - Additional values may be required in the case of installations requiring identification by means of the lights at an elevation of less than two degrees

Illustration 6 - TLOF perimeter lights, and flight path alignment guidance lighting system

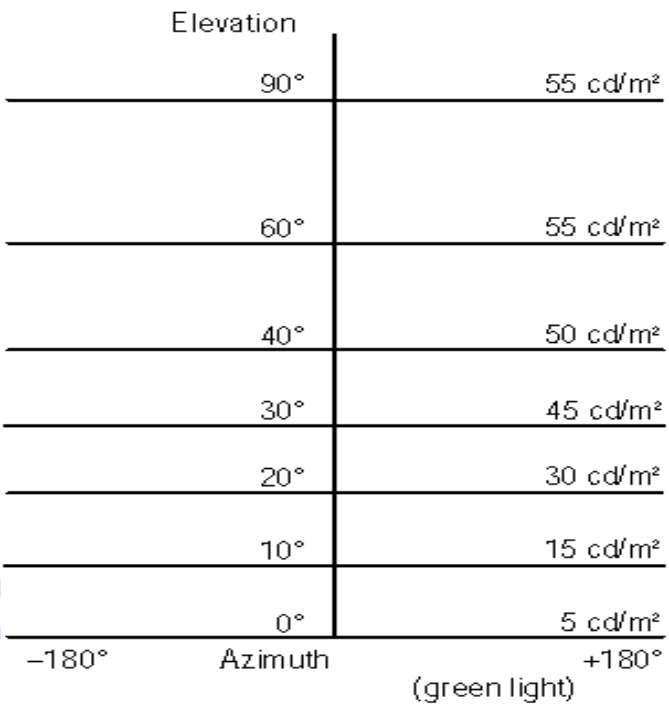


Illustration 7 – Touchdown and lift-off area luminescent pamels

Figure 5-11. Isocandela diagrams *(part 2/2)*

5.3.5.4 The light units shall be frangible and mounted as low as possible.

Signal format

5..3.5.5 Where the lights of the system need 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 pilot shall not be less than 3 minutes of arc.

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

Note — Requirements of 5.3.4.5 and 5.3.4.6 can be met for lights on a line normal to the line of sight if the light units are separated by 1 metre for every kilometre of viewing range

5..3.5.7 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.

5.3.5.8 The divergence of the “on track” sector of the system shall be as shown in Figure 5-l 1.

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

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

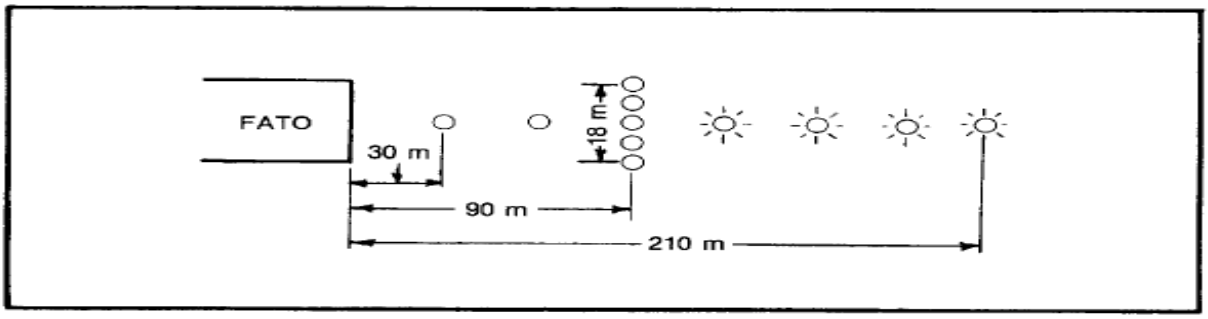


Figure 5-12 Approach lighting system

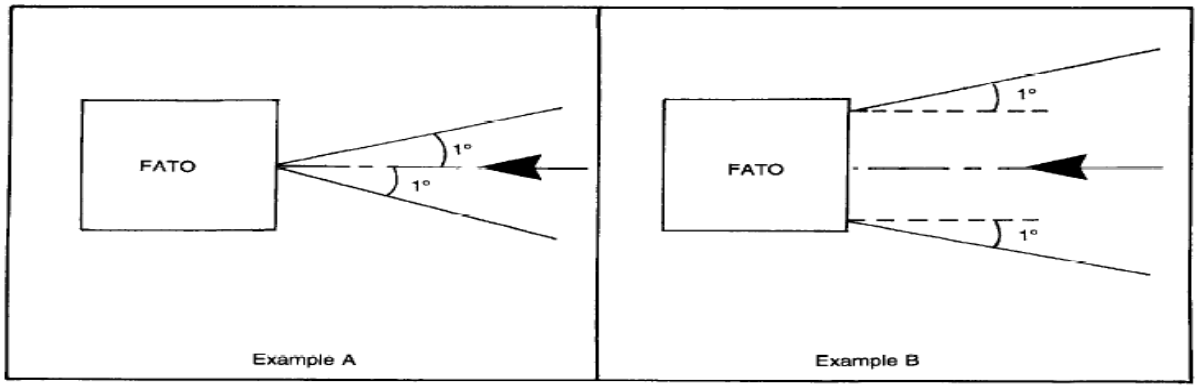


Figure 5-13 Divergence of the "on track" sector

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

5.3.5.12 The system shall not significantly increase the pilot workload

Light distribution

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

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

Approach track and azimuth setting

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

Location

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

5.3.5.17 The characteristics of the obstacle protection surface specified in 5.3.6.23, Table 5-l and Figure 5-13 shall equally apply to the system.

Characteristics of the visual alignment guidance system

5.3.5.18 In the event of the failure of any component affecting the signal format the system shall be automatically switched off. HAPI signal format

5.3.5.19 The light units shall be so designed that deposits of condensation, ice, dirt, etc. on optically transmitting or reflecting surfaces will interfere to the least possible extent with the light signal and will not cause spurious or false signals to be generated.

5.3.6 Visual approach slope indicator

Note — Care is required in the design of the unit to minimize spurious signals between the signal sectors and at the azimuth coverage limits.

Application

5.3.6.1 A visual approach slope indicator should be provided to serve the approach to a heliport, whether or not the heliport is served by other visual approach aids or by non-visual aids, where one or more of the following conditions exist especially at night:

5.3.6.2 The standard visual approach slope indicator systems for helicopter operations shall consist of the following:

a) PAPI and APAPI systems conforming to the specifications contained in Annex 14, Volume I, 5.3.5.23 to 5.3.5.40 inclusive except that the angular size of the on-slope sector of the systems shall be increased to 45 minutes; or

b) helicopter approach path indicator (HAPI) system conforming to the specifications in 5.3.6.6 to 5.3.6.21 inclusive.

Location

5.3.6.3 A visual approach slope indicator shall be located such that a helicopter is guided to the desired position within the final approach and take-off area and so as to avoid dazzling the pilot during final approach and landing

5.3.6.4 A visual approach slope indicator should be located adjacent to the nominal aiming point and aligned in azimuth with the preferred approach direction.

5.3.6.5 The light unit(s) shall be frangible and mounted as low as possible.

HAPI signal format

5.3.6.6 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.

5.3.6.7 The signal format of the HAPI shall be as shown in Figure 5-12, Illustrations A and B.

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

5.3.6.9 The on-to-off ratio of pulsing signals of the HAPI should be 1 to 1 and the modulation depth should be at least 80 percent.

5.3.6.10 The angular size of the "on-slope" sector of the HAPI shall be 45 minutes.
5.3.5.11 The angular size of the "slightly below" sector of the HAPI shall be 15 minutes.

Light distribution

5.3.6.12 The light intensity distribution of the HAPI in red and green colours should be as shown in Figure 5-9, Illustration 4.

Note — A larger azimuth coverage can be obtained by installing the HAPI system on a turntable.

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

5.3.6.14 The transmission factor of a red or green filter shall be not less than 15 percent at the maximum intensity setting.

5.3.6.15 At full intensity the red light of the HAPI shall have a Y-coordinate not exceeding 0.320 and the green light shall be within the boundaries specified in Annex 14, Volume I, Appendix 1, 2.1.3.

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

Approach slope and elevation setting

5.3.6.17 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.

5.3.6.18 The angle of elevation setting of HAPI shall be such that during an approach, the pilot of a helicopter observing the upper boundary of the "below slope" signal will clear all objects in the approach area by a safe margin.

Characteristics of the light unit

5.3.6.19 The system shall be so designed that:

a) in the event the vertical misalignment of a unit exceeds ± 0.5° (± 30 minutes), the system will switch off automatically; and

b) if the flashing mechanism fails, no light will be emitted in the failed flashing sector (s)

5.3.6.20 The light unit of the HAPI shall be so designed that deposits of condensation, ice, dirt, etc. on optically transmitting or reflecting surfaces will interfere to the least possible extent with the light signal and will not cause spurious or false signals to be generated.

5.3.6.21 A HAPI system intended for installation on a floating helideck should afford a stabilization of the beam to an accuracy o f ± 1/4 degree within k3-degree pitch and roll movement of the heliport.

Table 5-1. Dimensions and slopes of the obstacle protection surface

SURFACE AND DIMENSIONS	FATO	
Length of inner edge	Width of safety	
Distance from end of FATO	3m minimum	
Divergence	10%	
Total length	2 500 m	
Slope	PAPI	Aa - 0.57°
	HAPI	Ab - 0.65°
	APAPI	Aa -0.9°

a.As indicated in Annex 14, Volume I, Figure 5-19.
b.The angle of the upper boundary of the ―below slope‖ signal.

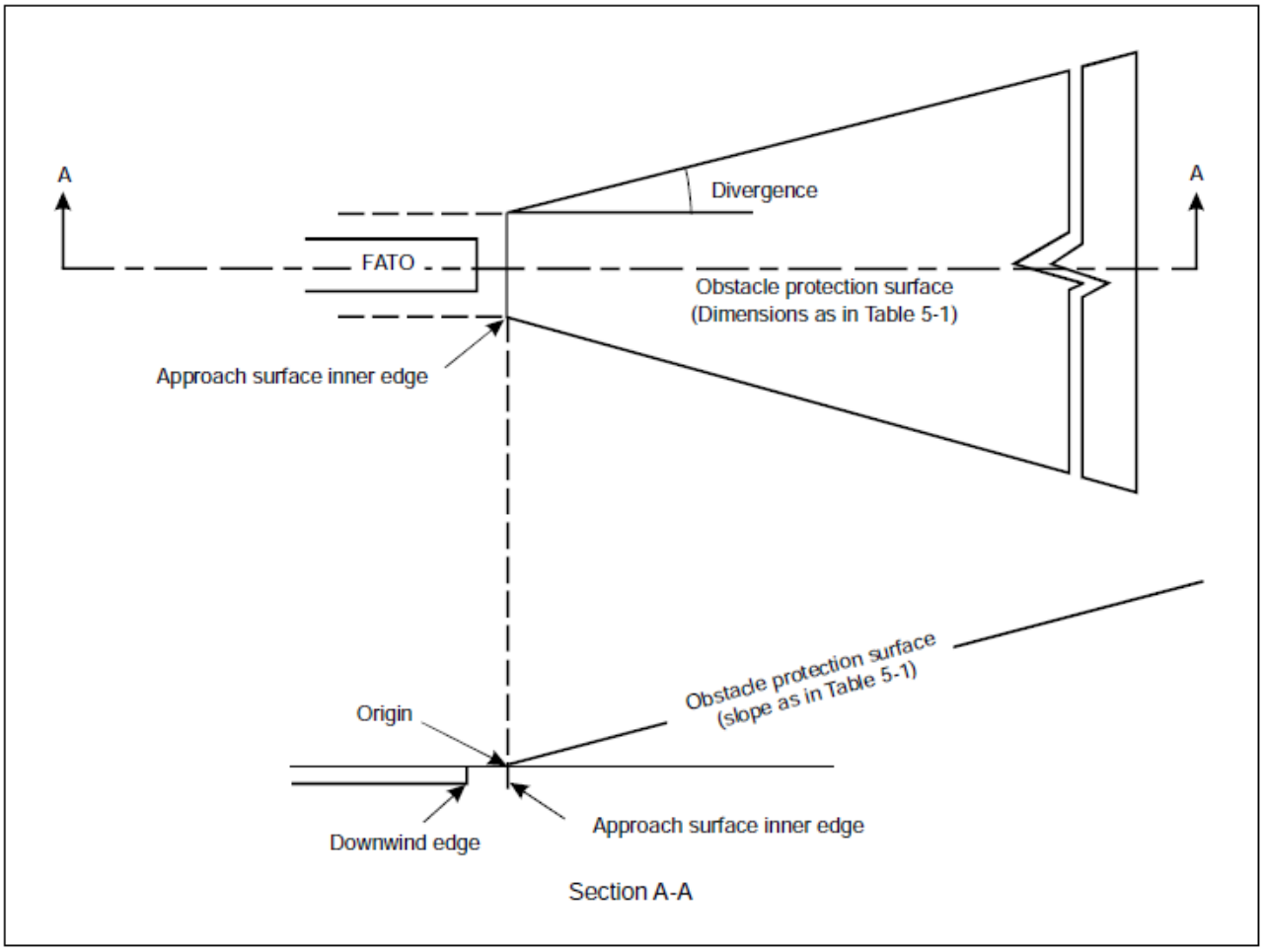


Figure 5-14 Obstacle protection surface for visual approach slope indicator systems

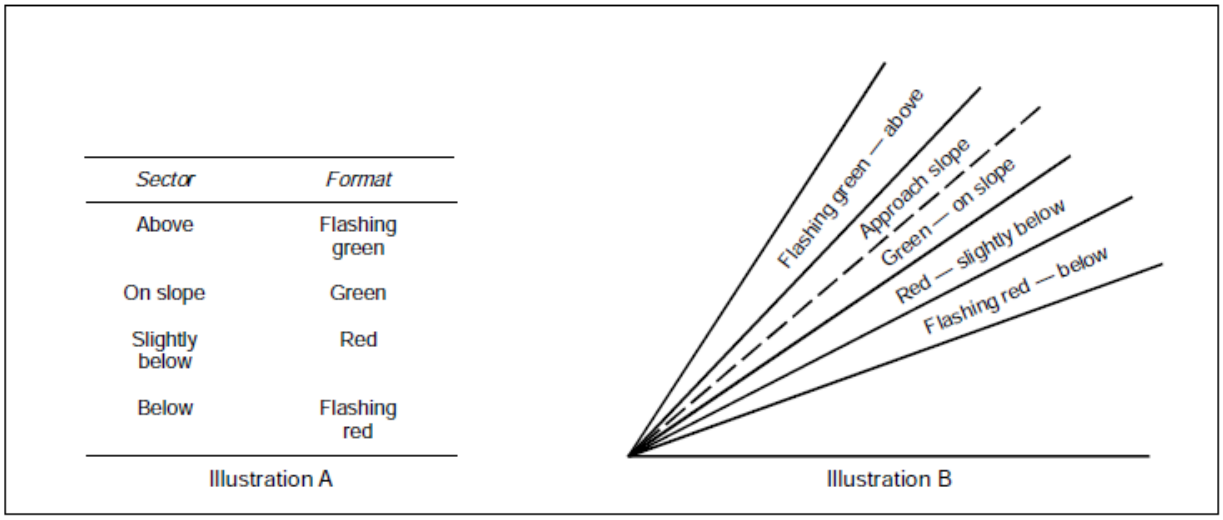


Figure5-15 HAPI signal format

Obstacle protection surface

Note — The following specifications apply to PAPI, APAPI and HAPI

5.3.6.22 An ' obstacle protection surface shall be established when it is intended to provide a visual approach slope indicator system

5.3.6.23 The characteristics of the obstacle protection surface, i.e. origin, divergence, length and slope shall correspond to those specified in the relevant column of Table 5-1 and in Figure 5-13.

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

Note — Circumstances in which the shielding principle may reasonably be applied are described in the Airport Services Manual, Part 6, (Doc 9137).

5.3.6.25 Existing objects above an obstacle protection surface shall be removed except when, in the opinion of the appropriate 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.

5.3.6.26 Where an aeronautical study indicates that an existing object extending above an obstacle protection surface could adversely affect the safety of 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 5 degrees;

d) suitably displace the final approach and take-off area; and

e) install a visual alignment guidance system specified in 5.3.4.

Note — Guidance on this issue is contained in the Heliport Manual (Doc 9261).

5.3.7 Final approach and take-off area lighting systems for surface level heliports Application

5.3.7.1 Where a final approach and take-off area is established at a surface level heliport on ground intended for use at night, final approach and take-off area lights shall be provided except that they may be omitted where the final approach and take-off area and the touchdown and lift-off area are nearly coincidental or the extent of the final approach and take-off area is self-evident.

Location

5.3.7.2 Final approach and take-off area lights shall be placed along the edges of the final approach and take-off area. The lights shall be uniformly spaced as follows:

a) for an area in the form of a square or rectangle, at intervals of not more than 50 m with a minimum of four lights on each side including a light at each comer; and

b) for any other shaped area, including a circular area, at intervals of not more than 5 m with a minimum of ten lights.

Characteristics

5.3.7.3 Final approach and take-off area lights shall be fixed omnidirectional lights showing white. Where the intensity of the lights is to be varied the lights shall show variable yellow.

5.3.7.4 The light distribution of final approach and take-off area lights should be as shown in Figure 5-9, Illustration 5.

5.3.7.5. The lights should not exceed a height of 2.5 cm and should be inset when a light extending above the surface would endanger helicopter operations. Where a final approach and take-off area is not meant for lift-off or touchdown, the lights should not exceed a height of 25 cm above ground or snow level.

5.3.8 Aiming point lights

Application

5.3.8.1 Where an aiming point marking is provided at a heliport intended for use at night, aiming point lights should be provided.

Location

5.3.8.2 Aiming point lights shall be collocated with the aiming point marking.

5.3.8.3 Aiming point lights shall form a pattern of at least six omnidirectional white lights as shown in Figure 5-4. The lights shall be inset when a light extending above the surface could endanger helicopter operations.

5.3.8.4 The light distribution of aiming point lights should be as shown in Figure 5-9, Illustration 5.

5.3.9 Touchdown and lift-off area lighting system

Note.- This subsection also applies to a FATO/TLOF lighting system

Application

5.3.9.1 A touchdown and lift-off area lighting system shall be provided at a heliport intended for use at night.

5.3.9.2 The touchdown and lift-off area lighting system for a surface level heliport shall consist of one or more of the following:

a) perimeter lights; or

b) floodlighting; or

c) luminescent panel lighting when a) and b) are not practicable and final approach and take-off area lights are available.

5.3.9.3 The touchdown and lift-off area lighting system for an elevated heliport or helideck shall consist of:

a) perimeter lights; and

b) floodlighting and/or luminescent panel lighting.

Note.- At elevated heliports and helidecks, surface texture cues within the touchdown and lift-off area are essential for helicopter positioning during the final approach and landing. Such cues are provided by using floodlighting or luminescent panel lighting or a combination of these two forms of lighting, in addition to perimeter lights.

5.3.9.4 Touchdown and lift-off area floodlighting or luminescent panel lighting should be provided at a surface-level heliport intended for use at night when enhanced sulfate texture cues are required.

Location

5.3.9.5 Touchdown and lift-off area perimeter lights shall be placed along the edge of the area designated for use as the touchdown and lift-off area or within a distance of 1.5 m from the edge. Where the touchdown and lift-off area is a circle the lights shall be:

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

b) where a) is not practicable, evenly spaced around the perimeter of the touchdown and lift-off area at the appropriate interval except that over a sector of 45” the lights shall be spaced at half spacing.

5.3.9.6 Touchdown and lift-off area perimeter lights shall be uniformly spaced at intervals of not more than 3 m for elevated heliports and helidecks and not more than 5 m for surface level heliports. There shall be a minimum number of four lights on each side including a light at each comer. For a circular touchdown and lift-off area, where lights are installed in accordance with 5.3.9.5 b) there shall be a minimum of fourteen lights.

Note.- Guidance on this issue is contained in the Heliport Manual.

5.3.9.7 The touchdown and lift-off area perimeter lights shall be installed at an elevated heliport or fixed helideck such that the pattern cannot be seen by the pilot from below the elevation of the touchdown and lift-off area.

5.3.9.8 The touchdown and lift-off area perimeter lights shall be installed at a floating helideck, such that the pattern cannot be seen by the pilot from below the elevation of the touchdown and lift-off area when the helideck is level.

5.3.9.9 On surface level heliports, luminescent panel lights shall be placed along the marking designating the edge of the touchdown and lift-off area. Where the touchdown and lift-off area is a circle the luminescent panels shall be located on straight lines circumscribing the area.

5.3.9.10 On surface level heliports the minimum number of panels on a touchdown and lift-off area shall be nine. The total length of luminescent panels in a pattern shall not be less than 50 per cent of the length of the pattern. There shall be an odd number with a minimum number of three panels on comer. Luminescent panels shall be uniformly spaced with a distance between adjacent panel ends of not more than 5 m on each side of the touchdown and lift-off area.

5.3.9.11 When luminescent panels are used on an elevated heliport or helideck to enhance surface texture cues the panels should not be placed adjacent to the perimeter lights. They should be placed around a touchdown marking where it is provided or coincident with heliport identification marking.

5.3.9.12 Touchdown and lift-off area floodlights shall be located 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.

Characteristics

5.3.9.13 The touchdown and lift-off area perimeter lights shall be fixed omnidirectional lights showing yellow.

5.3.9.14 At a surface level heliport the luminescent panels shall emit green light when used to define the boundary of the touchdown and lift-off area.

Note.- In other circumstances, luminescent panels may emit light of other colours.

5.3.9.15 The chromaticity and luminance of colours of luminescent panels should conform to Section 14, Volume I, Appendix 1, 3.4.

5.3.9.16 A luminescent panel shall have a minimum width of 6 cm. The panel housing shall be the same colour as the marking it defines.

5.3.9.17 The perimeter lights should not exceed a height of 25 cm and should be inset when a light extending above the surface could endanger helicopter operations.

5.3.9.18 The touchdown and liftoff area floodlights should not exceed a height of 25 cm.

5.3.9.19 The luminescent panels shall not extend above the surface by more than 2.5 cm.

5.3.9.20 The light distribution of the perimeter lights should be as shown in Figure 5-9, Illustration 6.

5.3.9.21 The light distribution of the luminescent panels should be as shown in Figure 5-9, Illustration 7.

5.3.9.22 The spectral distribution of touchdown and liftoff area floodlights shall be such that the surface and obstacle marking can be correctly identified.

5.3.9.23 The average horizontal illuminance of the floodlighting should be at least 10 lux, with a uniformity ratio (average to minimum) of not more than 8:l measured on the surface of the touchdown and lift-off area

5.3.9.24 Lighting use to identify the touchdown marking should comprise a segmented circle of omnidirectional ASPL stripes showing yellow. The segments should consist of ASPL stripes, and the total length of the ASPL stripe should not be less than 50 percent of the circumference of the circle.

5.3.9.25 If utilized, the heliport identification marking lighting should be omnidirectional showing green.

5.3.10 Winching area floodlighting

Application

5.3.10.1 Winching area floodlighting shall be provided at a winching area intended for use at night.

Location

5.3.10.2 Winching area floodlights shall be located 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.

Characteristics

5.3.10.3 The spectral distribution of winching area floodlights shall be such that the surface and obstacle markings can be correctly identified.

5.3.10.4 The average horizontal illuminance should be at least 10 lux, measured on the surface of the winching area.

5.3.11 Taxiway lights

Note.- The specifications for taxiway centre line lights and taxiway edge lights in Annex 14, Volume I, 5.3.i5 and 5.3.16 are equally applicable to taxiways intended for ground taxiing of helicopters

5.3.12 Visual aids for denoting obstacles

Note.- The specifications for marking and lighting of obstacles included in Annex 14, Volume I, Chapter 6, are equally applicable to heliports and winching areas.

5.3.13 Floodlighting of obstacles

Application

5.3.12.1 At a heliport intended for use at night, obstacles shall be floodlighted if it is not possible to display obstacle lights on them.

5.3.12.2 Obstacle floodlights shall be arranged so as to Obstacle floodlighting illuminate the entire obstacle and as far as practicable in a should be such as to produce a luminance of at least manner so as not to dazzle the helicopter pilots.

5.3.12.3 Obstacle floodlighting should be such as to produce a luminance of at least 10 cd/m2

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CHAPTER 6 – HELIPORT SERVICES

6.1 Rescue and fire fighting

General

Introductory Note.— These specifications apply to surface level heliports and elevated heliports only. The specifications complement those in Annex 14, Volume I, 9.2 concerning rescue and fire fighting requirements at aerodromes.

The principal objective of a rescue and fire fighting service is to save lives. For this reason, the provision of means of dealing with a helicopter accident or incident occurring at or in the immediate vicinity of a heliport assumes primary importance because it is within this area that there are the greatest opportunities of saving lives. This must assume at all times the possibility of, and need for, extinguishing a fire which may occur either immediately following a helicopter accident or incident or at any time during rescue operations.

The most important factors bearing on effective rescue in a survivable helicopter accident are the training received, the effectiveness of the equipment and the speed with which personnel and equipment designated for rescue and fire fighting purposes can be put into use

For an elevated heliport, requirements to protect any building or structure on which the heliport is located are not taken into account.

Rescue and fire fighting requirements for helidecks may be found in the Heliport Manual (Doc 9261).

For single or multi-helipads serving commercial use require the application of the fire fighting standards and are mandatory.

Level of protection to be provided

6.1.1 The level of protection to be provided for rescue and fire fighting should be based on the over-all length of the longest helicopter normally using the heliport and in accordance with the heliport fire fighting category determined from Table 6-1, except at an unattended heliport with a low movement rate.

Note.— Guidance to assist the appropriate authority in providing rescue and fire fighting equipment and services at surface-level and elevated heliports is given in the Heliport Manual.

Note.— For none public and or none commercial unattended heliports, elevated or ground helipads, fire hydrants are not mandatorily.

Note.— Fire extinguishers shall be provided for unattended or none commercial helipads based on heliport fire fighting category shown in table 6-1.

6.1.2 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.

Extinguishing agents

6.1.3 The principal extinguishing agent should be a foam meeting the minimum performance level B

Note.— Information on the required physical properties and fire extinguishing performance criteria needed for a foam to achieve an acceptable performance level B rating is given in the Airport Services Manual, Part 1.

6.1.4 The amounts of water for foam production and the complementary agents to be provided should be in accordance with the heliport fire fighting category determined under 6.1.1 and Table 6-2 or Table 6-3 as appropriate.

Note.— The amounts of water specified for elevated heliports do not have to be stored on or adjacent to the heliport if there is a suitable adjacent pressurized water main system capable of sustaining the required discharge rate.

6.1.5 At a surface-level heliport it is permissible to replace all or part of the amount of water for foam production by complementary agents.

6.1.6 The discharge rate of the foam solution should not be less than the rates shown in Table 6-2 or Table 6-3 as appropriate. The discharge rate of complementary agents should be selected for optimum effectiveness of the agent used.

6.1.7 At an elevated heliport, at least one hose spray line capable of delivering foam in a jet

Table 6-1. Heliport fire fighting category

Category	Helicopter over-all length [a]
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

a. Helicopter length, including the tail boom and the rotors

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Table 6-2. Minimum usable amounts of extinguishing agents for surface level heliports

Category	Foam meeting performance level B		Complementary agents				
	Water (L)	Discharge rate foam solution (L/min)	Dry chemical powders (kg)	or	Halons (kg)	or	CO_2 (kg)
(1)	(2)	(3)	(4)		(5)		(6)
H1	500	250	23		23		45
H2	1 000	500	45		45		90
H3	1 600	800	90		90		180

Table 6-3. Minimum usable amounts of extinguishing agents for elevated heliports

Category	Foam meeting performance level B		Complementary agents				
	Water (L)	Discharge rate foam solution (L/min)	Dry chemical powders (kg)	or	Halons (kg)	or	CO_2 (kg)
(1)	(2)	(3)	(4)		(5)		(6)
H1	2 500	250	45		45		90
H2	5 000	500	45		45		90
H3	8 000	800	45		45		90

spray pattern at 250 L/min should be provided. Additionally at elevated heliports in categories 2 and 3, at least two monitors should be provided each having a capability of achieving the required discharge rate and positioned at different locations around the heliports 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.

Rescue equipment

6.1.8 At an elevated heliport rescue equipment should be stored adjacent to the heliport.

Note.— Guidance on the rescue equipment to be provided at a heliport is given in the Heliport Manual.

Response time

6.1.9 At a surface-level heliport, the operational objective of the rescue and fire fighting service should be to achieve response times not exceeding two minutes in optimum conditions of visibility and surface conditions.

Note.— Response time is considered to be the time between the initial call to the rescue and fire fighting service and the time when the first responding vehicle(s) (the service) is (are) in position to apply foam at a rate of at least 50 per cent of the discharge rate specified in

6.1.10 At an elevated heliport, the rescue and fire fighting service should be immediately available on or in the vicinity of the heliport while helicopter movements are taking place.

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APPENDIX 1. AERONAUTICAL DATA QUALITY REQUIREMENTS

Table A1-1. Latitude and longitude

Latitude and longitude	Accuracy Data type	Integrity Classification
Heliport reference point	30 m surveyed/calculated	routine
Navaids located at the heliport	3 m surveyed	essential
Obstacles in Area 3	0.5 m surveyed	essential
Obstacles in Area 2 (the part within the heliport boundary)	5 m surveyed	essential
Geometric centre of TLOF or FATO thresholds	1 m surveyed	critical
Helicopter ground taxiway centre line points, and helicopter air taxiway points	0.5 m surveyed/calculated	essential
Helicopter ground taxiway intersection marking line	0.5 m surveyed	essential
Ground exit guidance line	0.5 m surveyed	essential
Apron boundaries (polygon)	1 m surveyed	routine
De-icing/anti-icing facility (polygon)	1 m surveyed	routine
Helicopter standpoints/INS checkpoints	0.5 m surveyed	routine

Note. — See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Table A1-2. Elevation/altitude/height

Elevation/altitude/height	Accuracy Data type	Integrity Classification
Heliport elevation	0.5 m Surveyed	essential
WGS–84 geoid undulation at heliport elevation position	0.5 m Surveyed	essential
FATO threshold, For heliports with or without a PinS approach	0.5 m surveyed	essential
WGS–84 geoid undulation at FATO threshold, TLOF geometric centre, for heliports with or without a PinS approach	0.5 m surveyed	essential
FATO threshold, for heliports intended to be operated in accordance with Appendix 2	0.25 m surveyed	critical
WGS–84 geoid undulation at FATO threshold, TLOF geometric centre, for heliports intended to be operated in accordance with Appendix 2	0.25 m surveyed	critical
Helicopter ground taxiway centre line points, and air taxiway	1 m surveyed	essential
Obstacles in Area 2 (the part within the heliport boundary)	0.5 m surveyed	essential
Obstacles in Area 3	3 m surveyed	essential
Distance measuring equipment/precision (DME/P)	3 m surveyed	essential

Note. — See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Table A1-3. Declination and magnetic variation

Declination/variation	Accuracy Data type	Integrity Classification
Heliport magnetic variation	1 degree Surveyed	1 × 10–5 essential
ILS localizer antenna magnetic variation	1 degree Surveyed	1 × 10–5 essential
MLS azimuth antenna magnetic variation	1 degree surveyed	1 × 10–5 essential

Table A1-4. Bearing

Bearing	Accuracy Data type	Integrity Classification
ILS localizer alignment	1/100 degree Surveyed	essential
MLS zero azimuth alignment	1/100 degree Surveyed	essential
FATO bearing (true)	1/100 degree surveyed	routine

Table A1-5. Length/distance/dimension

Length/distance/dimension	Accuracy Data type	Integrity Classification
FATO length, TLOF dimensions	1 m Surveyed	critical
Clearway length and width	1 m Surveyed	essential
Landing distance available	1 m surveyed	critical
Take-off distance available	1 m surveyed	critical
Rejected take-off distance available	1 m surveyed	critical
Helicopter ground or air taxiway/taxi-route width	1 m surveyed	essential
ILS localizer antenna-FATO end, distance	3 m calculated	routine
ILS glide slope antenna-threshold, distance along centre line	3 m calculated	routine
ILS marker-threshold distance	3 m calculated	essential
ILS DME antenna-threshold, distance along centre line	3 m calculated	essential
MLS azimuth antenna-FATO end, distance	3 m calculated	routine
MLS elevation antenna-threshold, distance along centre line	3 m calculated	routine
MLS DME/P antenna-threshold, distance along centre line	3 m calculated	essential

APPENDIX 2

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES FOR INSTRUMENT HELIPORTS WITH NON-PRECISION AND/OR PRECISION APPROACHES AND INSTRUMENT DEPARTURES

GENERAL

Introductory Note.- Annex 14, Volume II, contains Standards and Recommended Practices (specifications) that prescribe the physical characteristics and obstacle limitation surfaces to be provided for at heliports, and certain facilities and technical services normally provided at a heliport. It is not intended that these specifications limit or regulate the operation of an aircraft.

Note 1.– The specifications in this appendix describe additional conditions beyond those found in the main sections of Annex 14, Volume II, that apply to instrument heliports with non-precision and/or precision approaches. All specifications contained within the main chapters of Annex 14, Volume II are equally applicable to instrument heliports, but with reference to further provisions described in this Appendix.

HELIPORT DATA

2.3 Heliport Elevation

2.3.1 The elevation of the TLOF and/or the elevation and geoid undulation of each threshold of the FATO or FATO/TLOF (where appropriate) shall be measured and reported to the aeronautical information services authority to the accuracy of:

a. one-half metre or foot for non-precision approaches; and
b. one-quarter metre or foot for precision approaches.

Note.— Geoid undulation must be measured in accordance with the appropriate system of coordinates.

2.4 Heliport dimensions and related information

2.4.1 The following additional data shall be measured or described, as appropriate, for each facility provided on an instrument heliport:

a) distances to the nearest metre or foot of localizer and glide path elements comprising an instrument landing system (ILS) or azimuth and elevation antenna of a microwave landing system (MLS) in relation to the associated TLOF or FATO extremities.

PHYSICAL CHARACTERISTICS

3.1 Surface-level and elevated heliports

Safety Areas

3.1.1 A safety area surrounding an instrument FATO or FATO/TLOF shall extend:

a. laterally to a distance of at least 45 m on each side of the centre line; and
b. longitudinally to a distance of at least 60 m beyond the ends of the FATO.

Note.- See Figure A3-1.

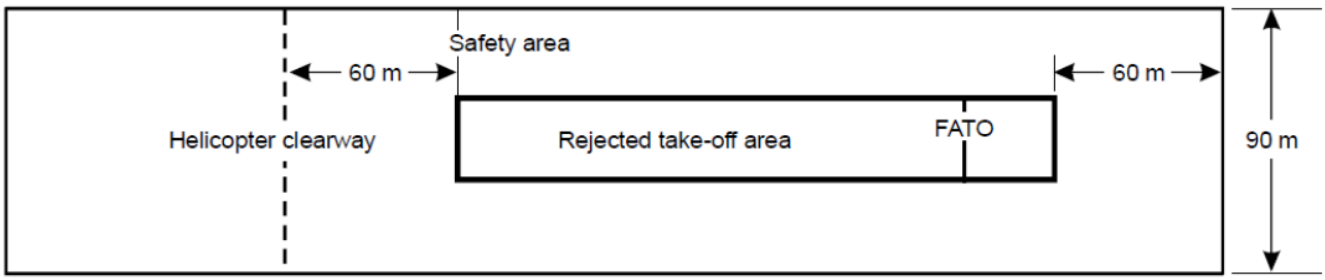

Figure A3-1. Safety Area for Instrument FATO

OBSTACLE ENVIRONMENT

4.1 Obstacle limitation surfaces and sectors

Approach surface

4.1.1 Characteristics. 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 plus the safety area, perpendicular to the centre line 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;
   i. for an instrument FATO with a non-precision approach, diverging uniformly at a specified rate from the vertical plane containing the centre line of the FATO
   ii. for an instrument FATO with a precision approach, diverging uniformly at a specified rate from the vertical plane containing the centre line of the FATO, to a specified height above FATO, 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 centre line of the approach surface and at a specified height above the elevation of the FATO.

4.2 Obstacle Limitation Requirements

4.2.1 The following obstacle limitation surfaces shall be established for an instrument FATO with a non-precision and/or precision approach:

a. surfaces. take-off climb surface;
b. approach surface; and
c. transitional

Note.- See Figure A4-1 to A4-4

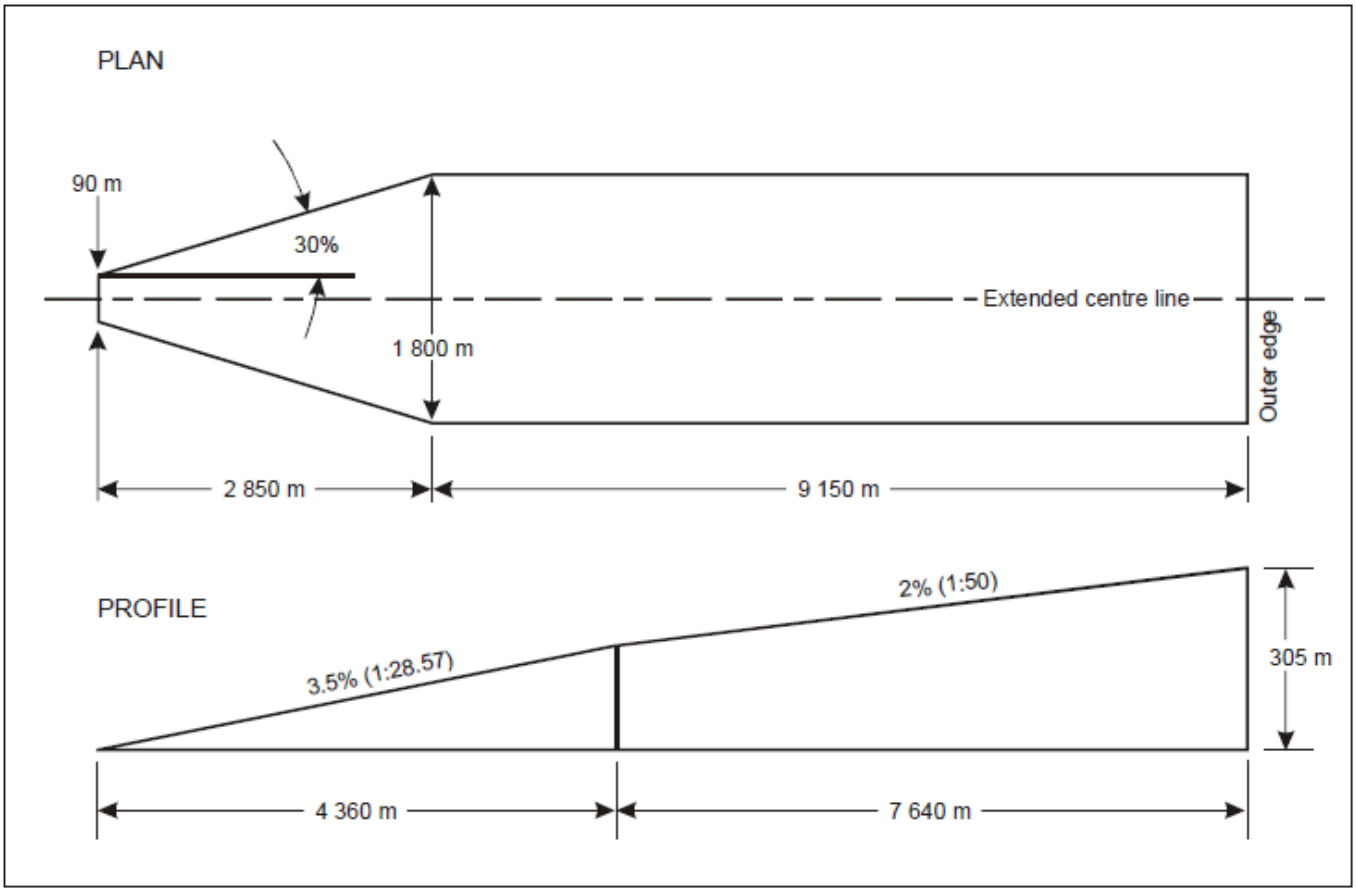

Figure 4-7. Take-off climb surface for instrument FATO

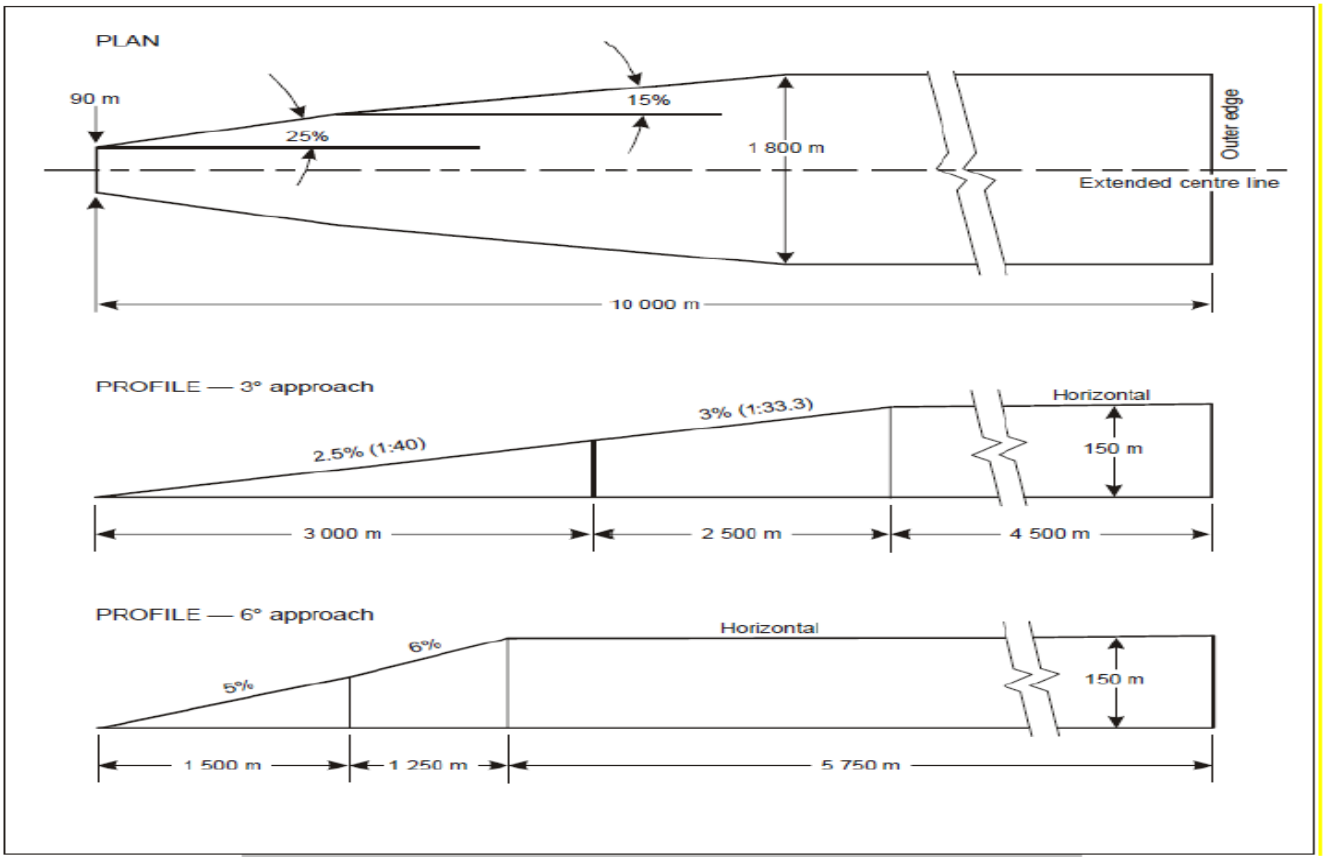

Figure A4-2. Approach surface for precision Approach FATO

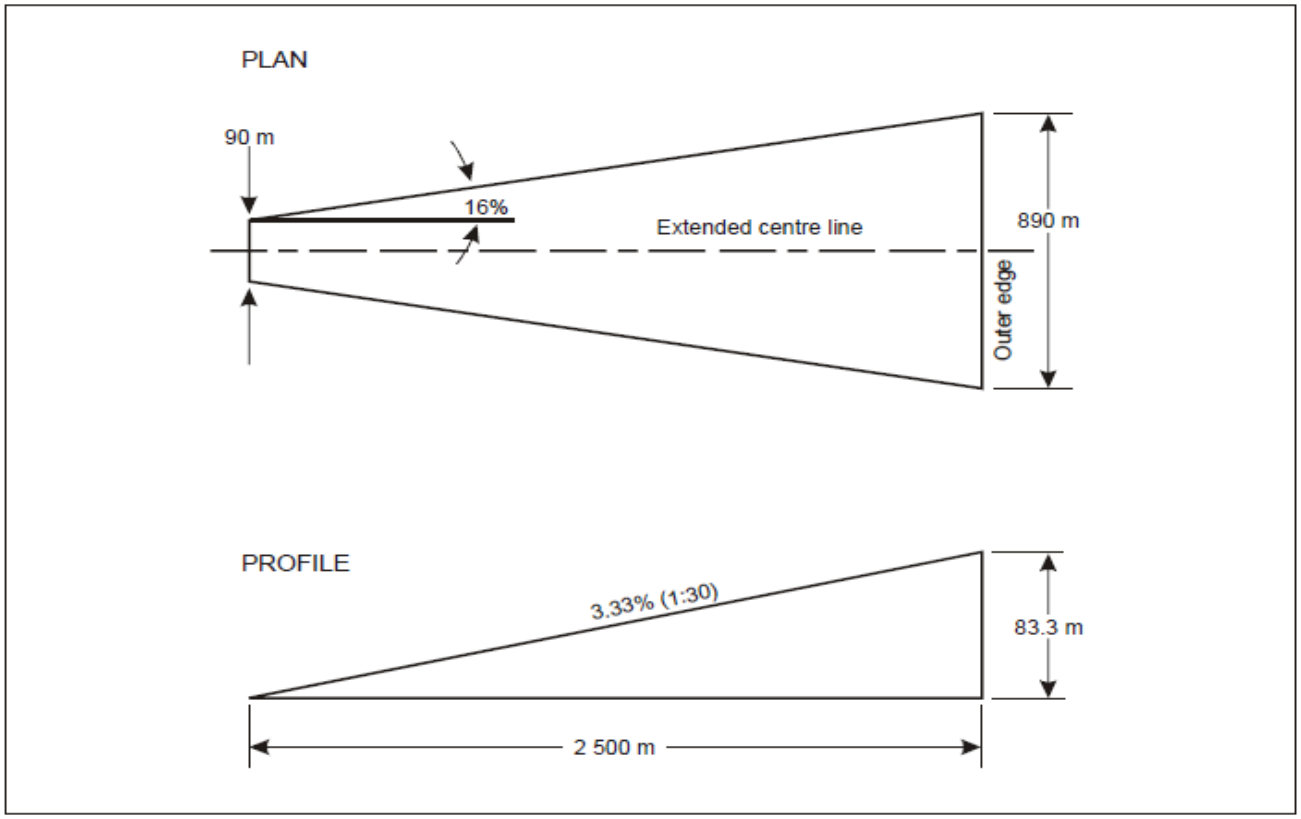

Figure A4-3. Approach surface for Non-precision Approach FATO

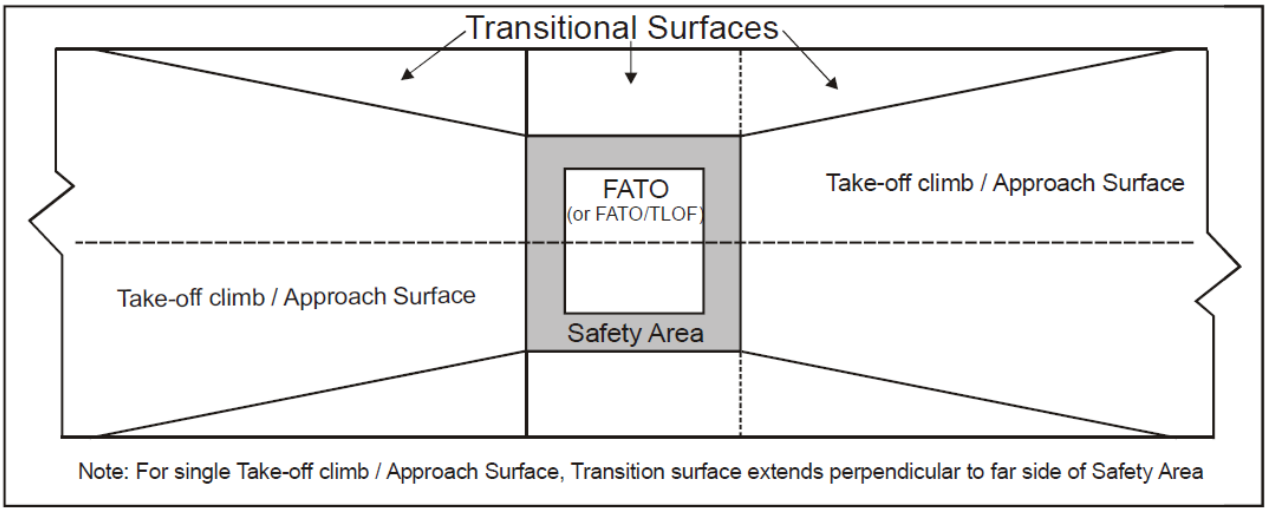

Figure A4-4 Transitional Surfaces for an instrument FATO with a non-precision and/or precision approach

4.2.2 The slopes of the obstacle limitation surfaces shall not be greater than, and their other dimensions not less than, those specified in Tables A4-1 to A4-3.

Table A4-1. Dimensions and slopes of Obstacle Limitation Surfaces
Instrument (Non-precision) FATO

Surface and dimensions		
APPROACH SURFACE		
Width of inner edge		Width of safety area
Location of inner edge		Boundary
First section		
Divergence	— day	16%
	— night	
Length	— day	2 500 m
	— night	
Outer width	— day	890 m
	— night	
Slope (maximum)		3.33%
Second section		
Divergence	— day	—
	— night	
Length	— day	—
	— night	
Outer width	— day	—
	— night	
Slope (maximum)		—
Third section		
Divergence		—
Length	— day	—
	— night	
Outer width	— day	—
	— night	
Slope (maximum)		—
TRANSITIONAL		
Slope		20%
Height		45 m

Table A4-2. Dimensions and slopes of Obstacle Limitation Surfaces
Instrument (Precision) FATO

	3° approach				6° approach			
	Height above FATO				Height above FATO			
Surface and dimensions	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 SURFACE								
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	60m
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 above FATO	962 m	671 m	526 m	380 m	521 m	380 m	307.5 m	235 m
Divergence to parallel section	15%	15%	15%	15%	15%	15%	15%	15%
Distance to 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
Width of parallel section	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m
Distance to 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% (1:40)	2.5% (1:40)	2.5% (1:40)	2.5% (1:40)	5% (1:20)	5% (1:20)	5% (1:20)	5% (1:20)
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% (1:33.3)	3% (1:33.3)	3% (1:33.3)	3% (1:33.3)	6% (1:16.66)	6% (1:16.66)	6% (1:16.66)	6% (1:16.66)
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
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

Table A4-3. Dimensions and slopes of Obstacle Limitation Surfaces
STRAIGHT TAKE-OFF

Surface and dimensions		Instrument
TAKE-OFF CLIMB		
Width of inner edge		90 m
Location of inner edge		Boundary or end of clearway
First section		
Divergence	— day	30%
	— night	
Length	— day	2 850 m
	— night	
Outer width	— day	1 800 m
	— night	
Slope (maximum)		3.5%
Second section		
Divergence	— day	parallel
	— night	
Length	— day	1 510 m
	— night	
Outer width	— day	1 800 m
	— night	
Slope (maximum)		3.5%*
Third section		
Divergence		parallel
Length	— day	7 640 m
	— night	
Outer width	— day	1 800 m
	— night	
Slope (maximum)		2%

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

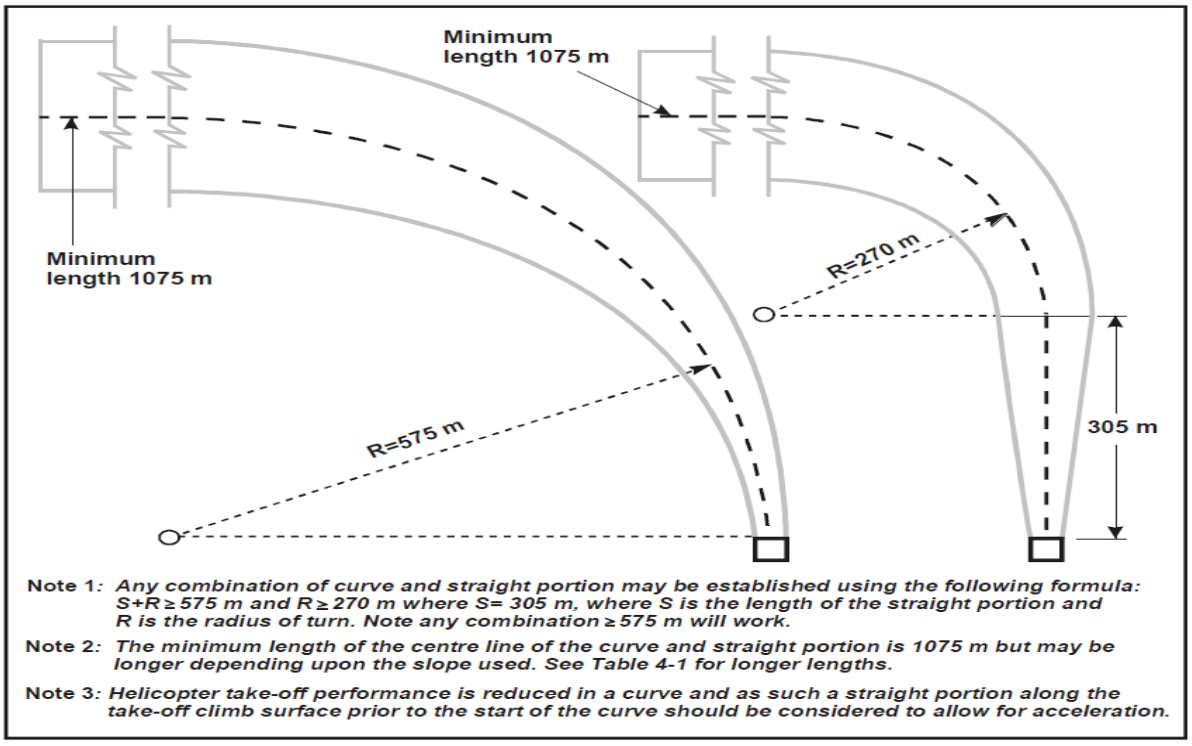

Figure 4-5. Curved approach and take-off climb surface for all FATOs including FATO/TLOFs

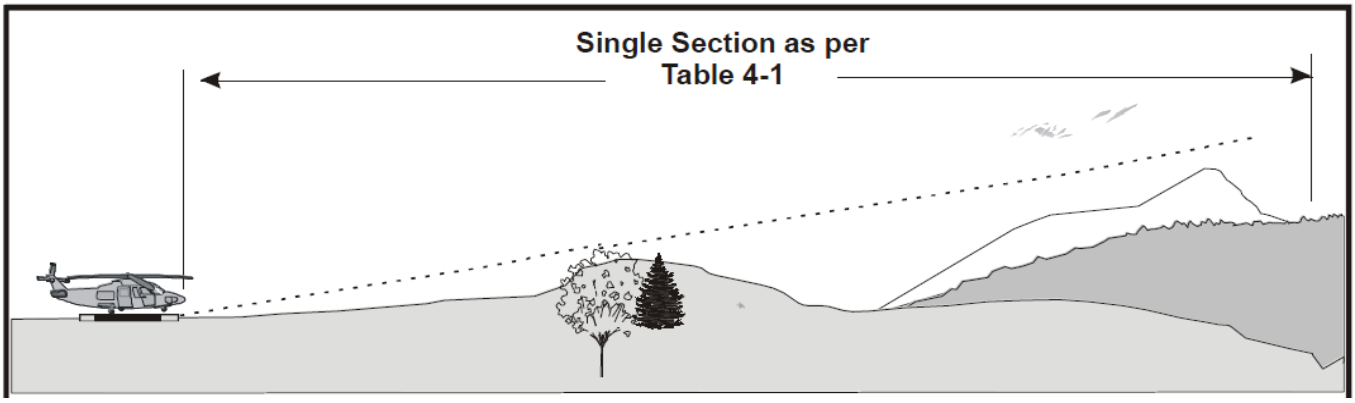

Figure 4-6(a) Approach & Take-off climb surfaces – "A" slope profile – typically 4.5%

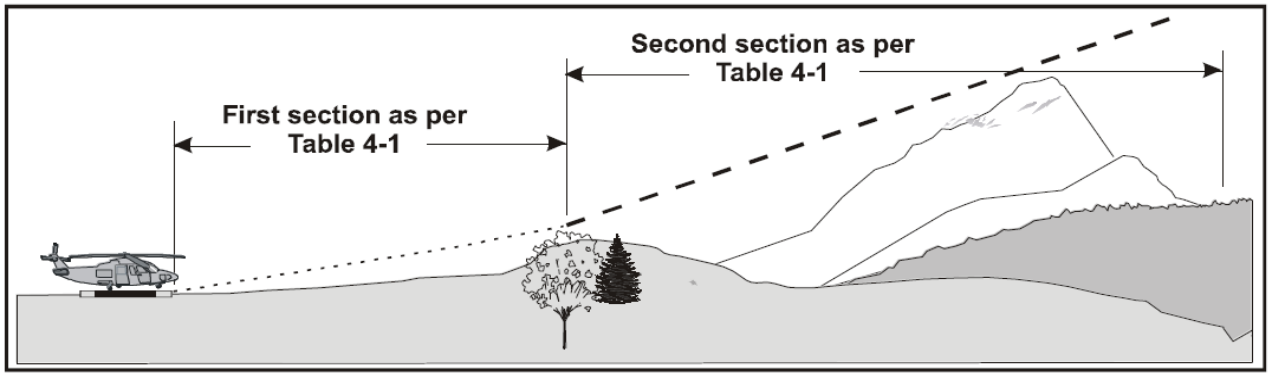

Figure 4-6(b) Approach & Take-off climb surface – "B" slope profile – typically 8% & 16%

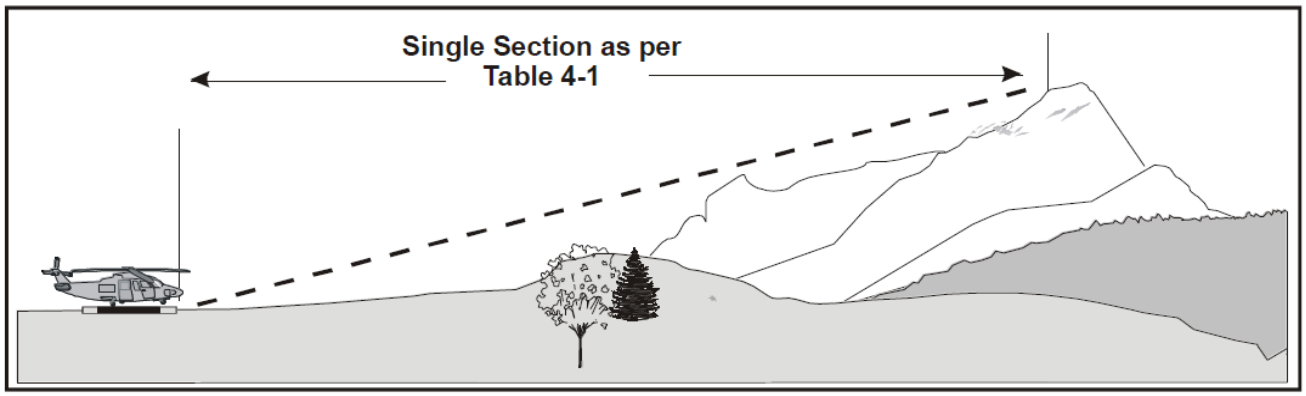

Figure 4-6(c) Approach & Take-off climb surface – "C" slope profile – typically 12.5%

VISUAL AIDS

5.3 Lights

5.3.3 Approach Lighting Systems

5.3.3.1 Where an approach lighting system is provided for a non-precision FATO, the system should not be less than 210 m in length.

5.3.3.2 The light distribution of steady lights should be as indicated in Figure 5-11, Illustration 2 except that the intensity should be increased by a factor of 3 for a non-precision FATO.

Table A5-1. Dimensions and slopes of the obstacle protection surface

SURFACE AND DIMENSIONS	NON-PRECISION FATO	
Length of inner edge	Width of safety	
Distance from end of FATO	60 m	
Divergence	15%	
Total length	2 500 m	
Slope	PAPI	Aa - 0.57°
	HAPI	Ab - 0.65°
	APAPI	Aa -0.9°

a.As indicated in Annex 14, Volume I, Figure 5-19.
b.The angle of the upper boundary of the ―below slope‖ signal.