RA 3512 - Permanent Fixed Wing Aerodrome - Obstacle Environment

Rationale

The presence of obstacles such as trees, buildings or cranes, in and around an Aerodrome could affect the safe operation of ►Aircraft.◄ The purpose of the Obstacle Limitation Surfaces (OLS) is to define the airspace around Aerodromes that is to be maintained free from obstacles to permit the intended ►Aircraft◄ operations at the Aerodromes to be conducted safely.

Contents

Regulation 3512(1)

Obstacle Limitation Surfaces

3512(1) Heads of Establishments (HoEs) and Aviation Duty Holder-Facing Organizations (ADH-Facing Organizations) **shall** ensure that OLS are established to limit the extent to which objects may project into the airspace around the Aerodrome(s) for which they are responsible.

Acceptable Means of Compliance 3512(1)

Obstacle Limitation Surfaces

Outer Horizontal.

1. ►The outer horizontal surface is of particular importance for safe operations in areas of high ground or where there are concentrations of obstacles. It represents the level above which consideration **should** be given to the control of new obstacles in order to facilitate practicable and efficient instrument approach procedures, and together with the conical and inner horizontal surfaces to ensure safe visual manoeuvring in the vicinity of an Aerodrome.◄ The outer horizontal surface **should**:

   a. ►Be established for every Aerodrome where the main Runway is 1100 m or more in length; and

   b. Be a horizontal plane extending from the periphery of the conical surface (Figure 1) to a minimum radius of 15000 m from the Aerodrome reference point when the main Runway is 1860 m or more in length, and to a minimum radius of 10000 m where the main Runway is 1100 m or more but less than 1860 m in length;◄ and

   c. Have an upper edge equal to the total height of the inner horizontal and conical surfaces.

Conical Surface.

2. The conical surface **should**:

Acceptable Means of Compliance 3512(1)

a. Be a surface sloping upwards and outwards from the periphery of the inner horizontal surface (Figure 1);

b. Have a lower edge coincident with the periphery of the inner horizontal surface;

c. Have an upper edge located at a specified height above the inner horizontal surface; and

d. Have a slope measured in a vertical plane perpendicular to the periphery of the inner horizontal surface.

e. Use the same reference point as for the inner horizontal surface.

Inner Horizontal.

3. The inner horizontal surface **should**:

a. Protect airspace for visual circling prior to landing;

b. Be a horizontal plane above an Aerodrome and its environs (Figure 1);

c. Have outer limits defined by circular arcs centred on

(1) For Aerodrome Codes 1 - 3, the midpoint between the Runway ends, excluding clearways and stopways;

(2) For Aerodrome Codes 4 - 6, the Runway ends, excluding clearways and stopways.

d. Have a height measured above an established elevation datum. The elevation datum used for the height of the inner horizontal surface **should** be:

(1) The elevation of the highest point of the lowest threshold of the related Runway; or

(2) The elevation of the highest point of the highest threshold of the related Runway; or

(3) The elevation of the highest point of the Runway; or

(4) The Aerodrome elevation.

Approach surface.

4. The approach surface **should**:

a. Be an inclined plane or combination of planes preceding the threshold (Figure 1);

b. Have limits comprising:

(1) An inner edge of specified length, horizontal and perpendicular to the extended centre-line of the Runway, and located at a specified distance before the threshold;

(2) Two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre-line of the Runway; and

(3) An outer edge parallel to the inner edge.

c. Have an elevation equal to the elevation of the mid-point of the threshold;

d. Have a slope measured in the vertical plane containing the centre-line of the Runway and **should** continue containing the centre-line of any lateral offset or curved ground track; and

e. Be varied when lateral offset, offset or curved approaches are utilized, specifically, two sides originated at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre-line of the lateral offset, or curved ground track.

Transitional Surface.

5. The transitional surface **should**:

Acceptable Means of Compliance 3512(1)

a. Extend from the side of the Runway strip and part of the side of the approach surface and slope upwards and outwards to the inner horizontal surface (Figure 1)[1];

b. Have limits comprising:

(1) A lower edge beginning at the intersection of the side of the approach surface with the inner horizontal surface and extending down the side of the approach surface to the inner edge of the approach surface and from there along the length of the strip parallel to the Runway centre-line; and

(2) An upper edge located in the plane of the inner horizontal surface.

c. Have an elevation of the lower edge that is:

(1) Along the side of the approach surface - equal to the elevation of the approach surface at that point; and

(2) Along the strip - equal to the elevation of the nearest point on the centre-line of the Runway or its extension.

d. Have a slope measured in a vertical plane at right angles to the centre-line of the Runway.

Take-off Climb Surface.

6. The take-off Climb Surface **should**:

a. Be an inclined plane or other specified Surface beyond the end of the Runway or clearway (Figure 1)[2];

b. Have limits comprising:

(1) An inner edge horizontal and perpendicular to the centre-line of the Runway, and located either at a specified distance beyond the end of the Runway, or at the end of the clearway when such is provided, and its length exceeds the specified distance;

(2) Two sides originating at the ends of the inner edge, diverging uniformly at a specified rate from the take-off track to a specified final width and continuing thereafter at that width for the remainder of the length of the take-off Climb Surface; and

(3) An outer edge horizontal and perpendicular to the specified take-off track.

c. Have an elevation of the inner edge equal to the highest point on the extended Runway centre-line between the end of the Runway and the inner edge, except that when a clearway is provided, the elevation **should** be equal to the highest point on the ground on the centre-line of the clearway; and

d. Have a slope that:

(1) For a straight take-off flight path, is measured in the vertical plane containing the centre-line of Runway; or

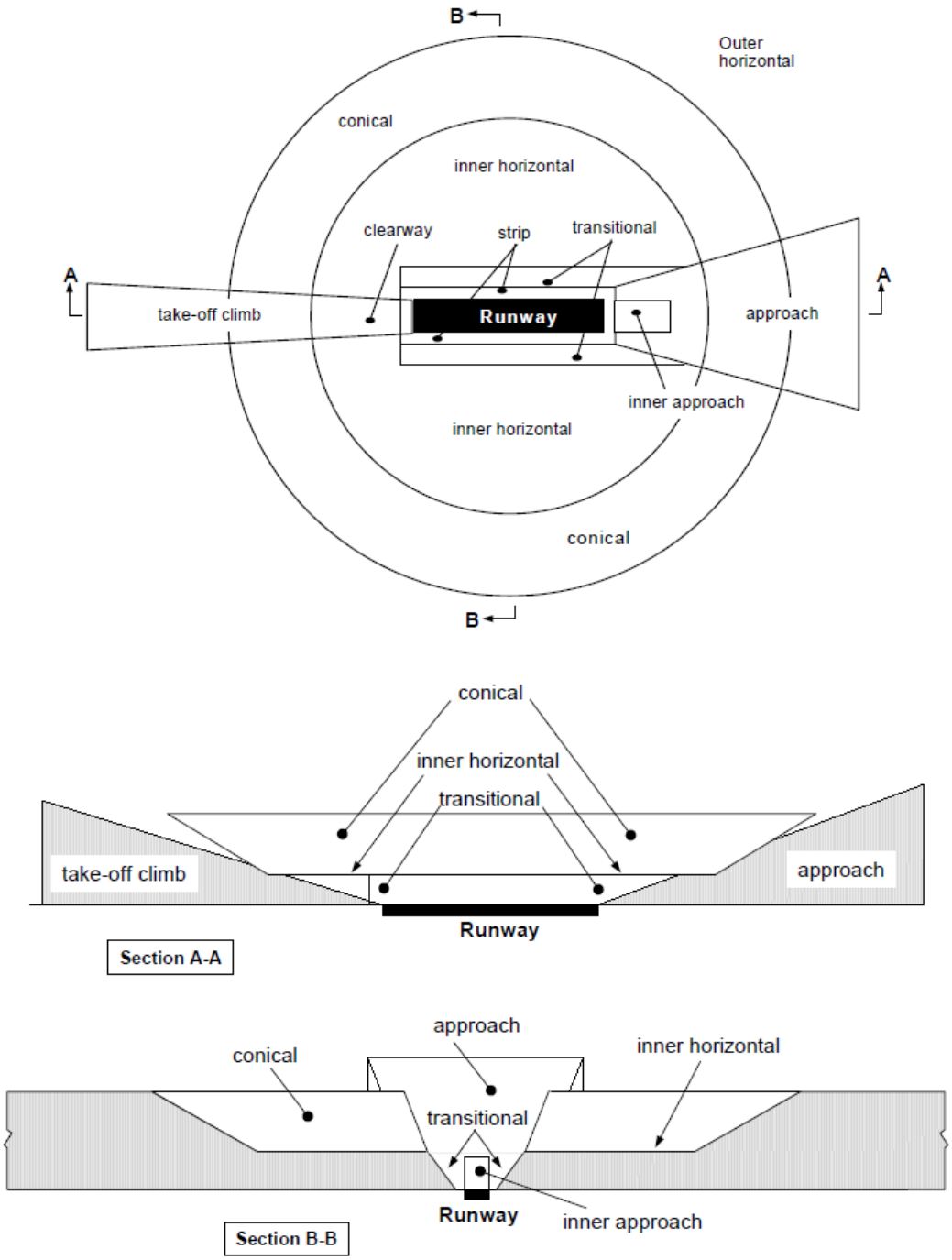
(2) For a take-off flight path involving a turn, is a complex surface containing the horizontal normal to its centre-line, and the slope of the centre-line **should** be the same as that for a straight take-off flight path.

7. Objects which do not project through the approach surface, but which would nevertheless adversely affect the optimum siting or performance of visual or non-visual aids **should**, as far as practicable, be removed.

[1] Includes the Runway strip for statutory safeguarding purposes.
[2] For statutory safeguarding purposes, the take-off climb surfaces will not be varied where the take-off flight path involves a turn. The elevation of the inner edge will be highest point on the extended Runway centreline or clearway supplied on the Measured Height Survey.

Acceptable Means of Compliance 3512(1)

Figure 1. Obstacle Limitation Surfaces



Guidance Material 3512(1)

Obstacle Limitation Surfaces

8. The purpose of the transitional surface is to define the limit of the area available for buildings, other structures or natural obstructions, such as trees.

9. The purpose of the take-off Climb Surface is to protect an ►Aircraft◄ on take-off and during climb-out.

10. Objects which penetrate the OLS may, in certain circumstances, cause an increase in the Obstacle Clearance Altitude / Height (OCA / H) for an instrument approach procedure or any associated visual circling procedure.

Civil Equivalence.

11. This Regulation is in line with International Civil Aviation Organization (ICAO) Annex 14 Vol I para 4.1.

Regulation 3512(2)

Obstacle Free Zones

3512(2) HoEs and ADH-Facing Organizations **shall** ensure that the Obstacle Free Zone is established, consisting of the following OLS; inner approach surface, inner transitional surface and balked landing surface.

Acceptable Means of Compliance 3512(2)

Obstacle Free Zones

Inner Approach surface.

12. The inner approach surface **should**:

a. Protect final precision approaches.

b. Be a rectangular portion of the approach surface immediately preceding the threshold (Figure 2); and

c. Have limits comprising:

(1) An inner edge coincident with the location of the inner edge of the approach surface but of its own specified length;

(2) Two sides originating at the ends of the inner edge and extending parallel to the vertical plane containing the centre-line of the Runway; and

(3) An outer edge parallel to the inner edge.

Inner Transitional Surface.

13. The inner transitional surface **should**:

a. Protect ►Aircraft◄ during precision approaches and balked landing.

b. Be a Surface similar to the transitional surface but closer to the Runway (Figure 2);

c. Have limits comprising:

(1) A lower edge beginning at the end of the inner approach surface and extending down the side of the inner approach surface to the inner edge of that surface, from there along the strip parallel to the Runway centre-line to the inner edge of the balked landing surface, and from there up the side of the balked landing surface to the point where the side intersects the inner horizontal surface; and

(2) An upper edge located in the plane of the inner horizontal surface.

d. Have an elevation of the lower edge that is:

(1) Along the side of the inner approach surface and balked landing surface - equal to the elevation of the particular surface at that point; and

(2) Along the strip - equal to the elevation of the nearest point on the centre-line of the Runway or its extension.

e. Have a slope that is measured in a vertical plane at right angles to the centre-line of the Runway.

Balked Landing Surface.

14. The balked landing surface **should**:

a. Protect an ►Aircraft◄ in the event of a balked landing.

b. Be an inclined plane located at a specified distance after the threshold, extending between the inner transitional surfaces (Figure 2);

c. Have limits comprising:

(1) An inner edge horizontal and perpendicular to the centre-line of the Runway and located at a specified distance after the threshold;

Acceptable Means of Compliance 3512(2)

(2) Two sides 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 Runway; and

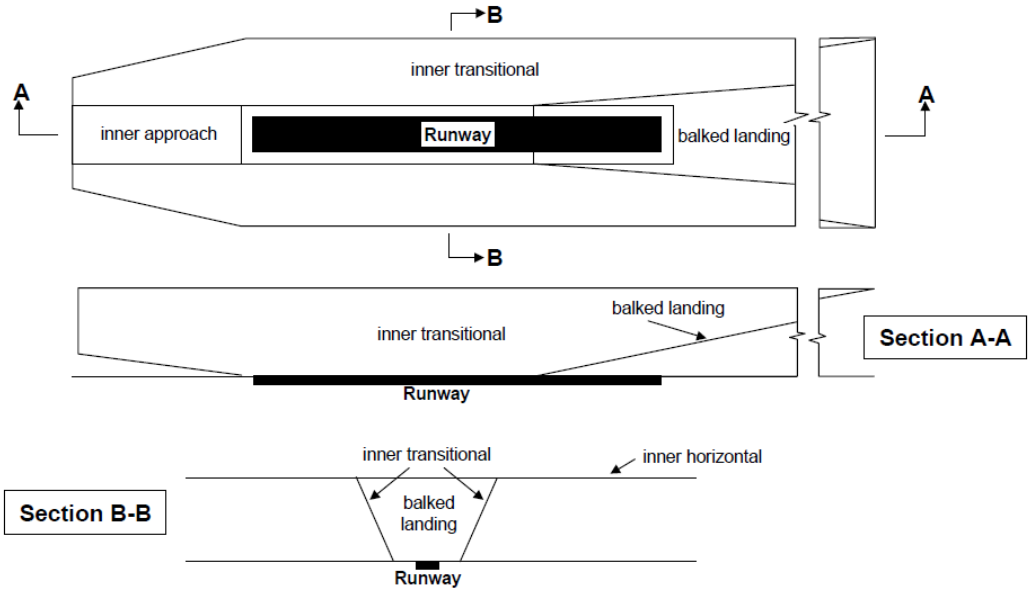
(3) An outer edge parallel to the inner edge and located in the plane of the inner horizontal surface.

d. Have an elevation of the inner edge equal to the elevation of the Runway centre-line at the location of the inner edge; and

e. Have a slope that is measured in the vertical plane containing the centre-line of the Runway.

15. Only frangible mounted obstacles, such as Aerodrome Ground Lighting (AGL) fittings, which are operationally essential, constructed and sited to reduce the Hazard to a minimum, **should** be used. Other operationally essential items include Runway caravans, arrestor installations and Runway Visual Range (RVR) towers[3]. Guidance on frangibility is contained in the ICAO Aerodrome Design Manual (Doc 9157), Part 6.

Figure 2. Inner Approach, Inner Transitional and Balked Landing OLS.



Guidance Material 3512(2)

Obstacle Free Zones

16. The Obstacle Free Zones surfaces are not calculated or mapped for safeguarding purposes.

Civil Equivalence.

17. This Regulation is in line with ICAO Annex 14 Vol I para 4.1.

Regulation 3512(3)

Obstacle Limitation Surfaces Requirements - Non-Instrument Runways

3512(3) HoEs and ADH-Facing Organizations **shall** ensure that the following obstacle limitation surfaces are established for a non-instrument Runway; conical, inner horizontal, outer horizontal, take-off climb, approach and transitional.

[3] Refer to RA 3590(12): Safeguarding – Operationally Essential Obstructions.

Acceptable Means of Compliance 3512(3)

Obstacle Limitation Surfaces Requirements - Non-Instrument Runways

18. The heights and slopes of the OLS **should** be in accordance with (iaw) those specified in Annex A.

19. New objects or extensions of existing objects **should not** be permitted above an approach surface within 3000 m of the inner edge or above a transitional surface except when the new object or extension would be shielded by an existing immovable object.

20. New objects or extensions of existing objects **should not** be permitted above the conical surface, inner horizontal surface ►or outer horizontal surface◄ except when the object would be shielded by an existing immovable object, or after Safety Assessment, it is determined that the object would not adversely affect the Safety or significantly affect the regularity of operations of ►Aircraft.◄

21. Existing objects above any of the conical surface, inner horizontal surface, approach surface and transitional surfaces **should** be removed except when the object is shielded by an existing immovable object, or after Safety Assessment it is determined that the object would not adversely affect the Safety or significantly affect the regularity of operations of ►Aircraft.◄

Guidance Material 3512(3)

Obstacle Limitation Surfaces Requirements - Non-Instrument Runways

22. In considering proposed construction, account may be taken of the possible future development of an instrument Runway and consequent requirement for more stringent OLS.

Civil Equivalence.

23. This Regulation is in line with ICAO Annex 14 Vol I para 4.2.

Regulation 3512(4)

Obstacle Limitation Surfaces Requirements - Non-Precision Approach Runways

3512(4) HoEs and ADH-Facing Organizations **shall** establish the following OLS for a non-precision approach Runway, conical, inner horizontal, outer horizontal, take-off climb, approach, and transitional.

Acceptable Means of Compliance 3512(4)

Obstacle Limitation Surfaces Requirements - Non-Precision Approach Runways

24. The heights and slopes of the OLS **should** be iaw those specified in Annex A.

25. The approach surface **should** be horizontal beyond the point at which the 2.5% slope intersects the higher of:

a. A horizontal plane 150 m above the threshold elevation; or

b. The horizontal plane passing through the top of any object that governs the OCA/H.

26. New objects or extensions of existing objects **should not** be permitted:

a. Above an approach surface within 3000 m of the inner edge or above a transitional Surface, except when the new object or extension would be shielded by an existing immovable object.

b. Above the approach surface beyond 3000 m from the inner edge, the conical Surface or inner horizontal surface except when the object would be shielded by an existing immovable object, or after a Safety Assessment, it is determined that the object would not adversely affect the Safety or significantly affect the regularity of operations of ►Aircraft.◄

Acceptable Means of Compliance 3512(4)

27. Existing objects above any of the surfaces required by ►this RA◄ **should** be removed except when the object would be shielded by an existing immovable object or, after Safety Assessment, it is determined that the object would not adversely affect the Safety or significantly affect the regularity of operations of ►Aircraft.◄

Guidance Material 3512(4)

Obstacle Limitation Surfaces Requirements - Non-Precision Approach Runways

Civil Equivalence.

28. This Regulation is in line with ICAO Annex 14 Vol I para 4.2.

Regulation 3512(5)

Obstacle Limitation Surfaces Requirements - Precision Approach (Cat I) Runways

3512(5) HoEs and ADH-Facing Organizations **shall** establish OLS for the following on a Precision Approach Runway Category I; conical, inner horizontal, outer horizontal, inner approach, take-off climb, approach, and transitional.

Acceptable Means of Compliance 3512(5)

Obstacle Limitation Surfaces Requirements - Precision Approach (Cat I) Runways

29. The heights and slopes of the surfaces **should not** be greater than, and their other dimensions **should not** be less than, those specified in Annex A, except in the case of the horizontal section of the approach surface (see below).

30. The approach surface **should** be horizontal beyond the point at which the 2.5% slope intersects the higher of:

a. A horizontal plane 150 m above the threshold elevation; or

b. The horizontal plane passing through the top of any object that governs the obstacle clearance limit.

31. Fixed objects **should not** be permitted above the inner approach surface, the inner transitional surface or the balked landing surface, except for frangible objects which because of their function **should** be located on the strip. Mobile objects **should not** be permitted above these surfaces during the use of the Runway for landing.

32. New objects or extensions of existing objects **should not** be permitted:

a. Above an approach surface within 3000 m of the inner edge or above a transitional surface except when the new object or extension would be shielded by an existing immovable object.

b. Above the conical surface, the inner horizontal surface ►or the outer horizontal surface◄ except when an object would be shielded by an existing immovable object, or after Safety Assessment, it is determined that the object would not adversely affect the Safety or significantly affect the regularity of operations of ►Aircraft.◄

33. Existing objects above an approach surface, a transitional surface, the conical surface and inner horizontal surface **should**, as far as practicable, be removed except when an object would be shielded by an existing immovable object, or after Safety Assessment, it is determined that the object would not adversely affect the Safety or significantly affect the regularity of operations of ►Aircraft.◄

Guidance Material 3512(5)

Obstacle Limitation Surfaces Requirements - Precision Approach (Cat I) Runways

Civil Equivalence.

34. This Regulation is in line with ICAO Annex 14 Vol I para 4.2.

Regulation 3512(6)

Obstacle Limitation Surfaces Requirements - Precision Approach (Cat II / III) Runways

3512(6) HoEs and ADH-Facing Organizations **shall** establish the following OLS for a Precision Approach Runway Category II or III; conical, inner horizontal, outer horizontal, take-off climb, approach and inner approach, transitional surfaces and inner transitional, and balked landing.

Acceptable Means of Compliance 3512(6)

Obstacle Limitation Surfaces Requirements - Precision Approach (Cat II / III) Runways

35. The heights and slopes of the surfaces **should not** be greater than, and their other dimensions **should not** be less than, those specified in Annex A, except in the case of the horizontal section of the Approach surface (see below).

36. The approach surface **should** be horizontal beyond the point at which the 2.5% slope intersects the higher of:

a. A horizontal plane 150 m above the threshold elevation; or

b. The horizontal plane passing through the top of any object that governs the obstacle clearance limit.

37. Fixed objects **should not** be permitted above the inner approach surface, the inner transitional surface or the balked landing surface, except for frangible objects which because of their function **should** be located on the strip. Mobile objects **should not** be permitted above these surfaces during the use of the Runway for landing.

38. New objects or extensions of existing objects **should not** be permitted above an approach surface within 3000 m of the inner edge or above a transitional surface except when the new object or extension would be shielded by an existing immovable object.

39. New objects or extensions of existing objects **should not** be permitted above the conical surface, the inner horizontal surface ►or the outer horizontal surface◄ except when an object would be shielded by an existing immovable object, or after Safety Assessment, it is determined that the object would not adversely affect the Safety or significantly affect the regularity of operations of ►Aircraft.◄

40. Existing objects above an approach surface, a transitional surface, the conical surface and inner horizontal surface **should**, as far as practicable, be removed except when an object would be shielded by an existing immovable object, or after Safety Assessment, it is determined that the object would not adversely affect the Safety or significantly affect the regularity of operations of ►Aircraft.◄

Guidance Material 3512(6)

Obstacle Limitation Surfaces Requirements - Precision Approach (Cat II / III) Runways

Civil Equivalence.

41. This Regulation is in line with ICAO Annex 14 Vol I para 4.2.

Regulation 3512(7)

Obstacle Limitation Surfaces Requirements - Runways Meant For Take-Off

3512(7) HoEs and ADH-Facing Organizations **shall** establish a take-off climb surface for a Runway meant for take-off.

Acceptable Means of Compliance 3512(7)

Obstacle Limitation Surfaces Requirements - Runways Meant For Take-Off

42. The dimensions of the surface **should not** be less than the dimensions specified in Annex B, except that a lesser length may be adopted for the take-off climb

Acceptable Means of Compliance 3512(7)

surface where such lesser length would be consistent with procedural measures adopted to govern the outward flight of ►Aircraft.◄

43. New objects or extensions of existing objects **should not** be permitted above a take-off climb surface except when the new object or extension would be shielded by an existing immovable object.

44. Existing objects that extend above a take-off climb surface **should**, as far as practicable, be removed except when an object is shielded by an existing immovable object, or after Safety Assessment it is determined that the object would not adversely affect the Safety or significantly affect the regularity of operations of ►Aircraft.◄

Guidance Material 3512(7)

Obstacle Limitation Surfaces Requirements - Runways Meant For Take-Off

Civil Equivalence.

45. This Regulation is in line with ICAO Annex 14 Vol I para 4.2.

Regulation 3512(8)

Objects Outside the Obstacle Limitation Surfaces

3512(8) HoEs and ADH-Facing Organizations **shall** ensure that proposed construction beyond the limits of the OLS are assessed where it may constitute a Hazard to ►Aircraft.◄

Acceptable Means of Compliance 3512(8)

Objects Outside the Obstacle Limitation Surfaces

46. Construction outside the vertical or lateral limits of the OLS, which may constitute a Hazard to ►Aircraft◄ **should** be assessed to determine whether operating limitations need to be applied.

47. Objects which extend to a height of 150 m or more above ground elevation **should** be regarded as obstacles, unless a special aeronautical study indicates that they do not constitute a Hazard to ►Aircraft.◄

Guidance Material 3512(8)

Objects Outside the Obstacle Limitation Surfaces

Civil Equivalence.

48. This Regulation is in line with ICAO Annex 14 Vol I para 4.3.

ANNEX A

Dimensions of slopes of obstacle limitation surfaces – Approach Runways

	Non-instrument				Non-precision approach			Precision approach category		
	Code number				Code number			I		II or III
								Code number		Code number
Surface and dimensions [a]	1	2	3	4►◄	1,2	3	4►◄	1,2	3,4	3-►4◄
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
CONICAL										
Slope (%)	5	5	5	5	5	5	5	5	5	5
Height (m)	35	55	75	100	60	75	100	60	100	100
INNER HORIZONTAL										
Height (m)	45	45	45	45	45	45	45	45	45	45
Radius (m)	2 000	2 500	4 000	4 000	3 500	4 000	4 000	3 500	4 000	4 000
►◄										
INNER APPROACH										
Width	-	-	-	-	-	-	-	90	120[e]	120[e]
Distance from threshold	-	-	-	-	-	-	-	60	60	60
Length (m)	-	-	-	-	-	-	-	900	900	900
Slope (%)								2.5	2	2
APPROACH										
Length of inner edge (m)	60	80	150	150	150	►280	280	140	280	280◄
Distance from threshold (m)	30	60	60	60	60	60	60	60	60	60
Divergence (each side) (%)	10	10	10	10	15	15	15	15	15	15
First section										
Length (m)	1 600	2 500	3 000	3 000	2 500	3 000	3 000	3 000	3 000	3 000
Slope (%)	5	4	3.33	2.5	3.33	2	2	2.5	2	2
Second Section										
Length (m)	-	-	-	-	-	3 600[b]	3 600[b]	12 000	3 600[b]	3 600[b]
Slope (%)	-	-	-	-	-	2.5	2.5	3	2.5	2.5
Horizontal Section										
Length (m)	-	-	-	-	-	8 400[b]	8 400[b]	-	8 400[b]	8 400[b]
Total length (m)	-	-	-	-	-	15 000	15 000	15 000	15 000	15 000
TRANSITIONAL										
Slope (%)	20	20	14.3	14.3	20	14.3	14.3	14.3	14.3	14.3
INNER TRANSITIONAL										
Slope (%)	-	-	-	-	-	-	-	40	33.3	33.3
BALKED LANDING SURFACE										
Length of inner edge (m)	-	-	-	-	-	-	-	90	120[e]	120[e]
Distance from threshold (m)	-	-	-	-	-	-	-	c	1 800[d]	1800[d]
Divergence (each side) (%)	-	-	-	-	-	-	-	10	10	10
Slope (%)	-	-	-	-	-	-	-	4	3.33	3.33

a. All dimensions are measured horizontally unless specified otherwise.
b. ►Variable length (see RA 3512(4) para 25, RA 3512(5) para 30, RA 3512(6) para 36).◄
c. Distance to the end of strip.
d. Or end of Runway whichever is less.
e. Where the code letter is F the width is increased to ►140 m◄. For information on code letter F ►Aircraft◄ equipped with digital avionics that provide steering commands to maintain an established track during the go-around manoeuvre, see Circulars 301 ►and 345, and Chapter 4 of the PANS-Aerodromes, Part I (Doc 9981) for further information.◄

ANNEX B

Dimensions of slopes of obstacle limitation surfaces – Runways Meant for Take-off

	Code number		
Surface and dimensions [a]	1	2	3 or 4
(1)	(2)	(3)	(4)
TAKE-OFF CLIMB			
Length of inner edge	60 m	80 m	180 m
Distance from Runway end[b]	30 m	60 m	60 m
Divergence (each side)	10%	10%	►12.5%◄
Final width	380 m	580 m	1200 m
			1800 m[c]
Length	1600 m	2500 m	15000 m
Slope	5%	4%	2%[d]
a. All dimensions are measured horizontally unless specified otherwise.			
b. The take-off climb surface starts at the end of the clearway if the clearway length exceeds the specified distance.			
c. 1800 m when the intended track includes changes of heading greater than 15° for operations conducted in IMC, VMC by night.			
d. See 4.2.24 and 4.2.26.			

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