

GASR
WORKING GROUP

GAR
Subpart G – Obstacle restriction and removal

SECTION 1

SUBPART G – OBSTACLE RESTRICTION AND REMOVAL

Definitions

Immovable object

An object, which nature is such that its presence may be described as permanent.

GAR 1.G001 General

(See ACJ-GAR (IEM) 1.G001 Applicability and GAR 1.J160 Obstacle protection surface)

(a) The objectives of the specifications in this Subpart are to define the airspace on and around aerodromes to be maintained free from obstacles, so as

- (1) to permit the intended aircraft operations at the aerodromes to be conducted safely and regularly,
- (2) to prevent the aerodromes from becoming unusable by the growth of obstacles around the aerodromes, and
- (3) to define what object and terrain to be reported to the Aeronautical Information Service.

(b) This subpart shall be used by national governments, local land use planning authorities, aerodrome operators and property owners to adopt and respect airport zoning limitations in order to gain objectives mentioned above.

(c) Obstacle limitation surfaces, protection surfaces and areas shall be established around the aerodrome in order to define the limits to which objects may project into the airspace.

(d) National arrangements shall be made to enable the appropriate authority to be consulted concerning proposed construction within the limits of the obstacle limitation surfaces and protection surfaces in order to permit an aeronautical study of the effect of such construction on the operation of aeroplanes.

GAR 1.G005 Obstacle limitation requirements: general points

(See ACJ-GAR (IEM) 1.G005)

Obstacle limitation requirements have to be distinguished between:

- (1) Non instrumental runways;
- (2) Non precision approach runways;
- (3) Precision approach runways
- (4) Runways meant for take-off

GAR1.G006 Obstacles in the RWY vicinity

(See GAR 1.Fxxx reference to RWY strip)

(a) No object shall be permitted, except equipment or installation required for air navigation purposes, less than

- 1) 30 m for code 1 non instrument approach runway centreline,
- 2) 40 m for code 2 non instrument approach runway centreline,
- 3) 75 m for code 3 or 4 non instrument approach runway centreline and for code 1 or 2 instrument approach runway centreline,
- 4) 150 m from code 3 and 4 instrument approach runway centreline
- 5) 60 m from runway end or stopway end when existing except for code 1 non-instrument runway where this distance is reduced to 30 m.

(b) Such equipment or installation required for air navigation purposes on this area shall be frangible and mounted as low as possible.

GAR1.G007 Obstacle limitations in protection surfaces

(See GAR 1.G085)

(a) An obstacle protection surface shall be established for each visual approach slope indicator system.

(b) New objects or extensions of existing objects shall be considered as an obstacle and not to 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.

(c) Existing objects above an obstacle protection surface shall be considered as an obstacle and 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 aircraft.

(d) Where an aeronautical study indicates that an existing object extending above an obstacle protection surface could adversely affect the safety of operations of aircraft one or more of the following measures shall be taken:

- 1) Suitably raise the approach slope of the system;
- 2) reduce the azimuth spread of the system so that the object is outside the confines of the beam;
- 3) displace the axis of the system and its associated obstacle protection surface by no more than 5 degrees;
- 4) suitably displace the threshold; and
- 5) where d) is found to be impracticable, suitably displace the system upwind of the threshold to provide an increase in threshold crossing height equal to the height of the object penetration.

GAR 1.G010 Obstacle limitation requirements for non-instrument runways

(See ACJ-GAR (IEM) 1.G010)

(a) The following obstacle limitation surfaces shall be established for a non-instrument runway:

- (1) conical surface;
- (2) inner horizontal surface;
- (3) approach surface; and
- (4) transitional surfaces.

(b) The heights and slopes of the surfaces shall not be greater than, and their other dimensions not less than, those specified in Table 1.G010.

(c) New objects or extensions of existing objects shall not be permitted above an approach or transitional surface except when, in the opinion of the appropriate authority, the new object or extension would be shielded by an existing immovable object.

(d) New objects or extensions of existing objects shall not be permitted above the conical surface or inner horizontal surface except when, in the opinion of the appropriate authority, the object would be shielded by an existing immovable object, or after an aeronautical study it is determined that the object would not adversely affect the safety.

(e) Existing objects above any of the surfaces required by GAR 1.G010 Obstacle limitation requirements for non-instrument runways (a) shall be removed except when, in the opinion of the appropriate authority, the object is shielded by an existing immovable object, or after an aeronautical study it is determined that the object would not adversely affect the safety.

Table GAR 1.G010 Dimensions and slopes of obstacle limitation surfaces – Non-instrument approach runways

Surface and dimensions ^a (1)	Non-instrument approach runway			
	Code number			
	1 (2)	2 (3)	3 (4)	4 (5)
CONICAL				
Slope	5%	5%	5%	5%
Height	35 m	55 m	75 m	100 m
INNER HORIZONTAL				
Height	45 m	45 m	45 m	45 m
Radius	2 000 m	2 500 m	4 000 m	4 000 m
APPROACH				
Length of inner edge	60 m	80 m	150 m	150 m
Distance from threshold	30 m	60m	60 m	60 m
Divergence (each side)	10%	10%	10%	10%
Length	1 600 m	2 500 m	3 000 m	3 000 m
Slope	5%	4%	3.33%	2.5%
TRANSITIONAL				
Slope	20%	20%	14.3%	14.3%
a. All dimensions are measured horizontally unless specified otherwise.				

GAR 1.G015 Obstacle limitation requirements for non-precision approach runways

(See ACJ ACJ-GAR (IEM) 1.G015

(a) The following obstacle limitation surfaces shall be established for a non-precision approach runway:

- (1) Conical surface;
- (2) Inner horizontal surface;
- (3) Approach surface; and
- (4) Transitional surfaces.

(b) The heights and slopes of the surfaces shall not be greater than, and their other dimensions not less than, those specified in Table GAR 1.G015, except in the case of the horizontal section of the approach surface (see GAR 1.G015 Obstacle limitation requirements for non-precision approach runways c).

(c) The approach surface shall be horizontal beyond the point at which the 2.5 per cent slope intersects:

- (1) a horizontal plane 150 m above the threshold elevation; or
- (2) the horizontal plane passing through the top of any object that governs the obstacle clearance altitude/height (OCA/H);

whichever is the higher.

(d) New objects or extensions of existing objects shall not be permitted above an approach surface within 3000 m of the inner edge or above a transitional surface except when, in the opinion of the appropriate authority, the new object or extension would be shielded by an existing immovable object.

Table GAR 1.G015. Dimensions and slopes of obstacle limitation surfaces – Non-precision approach runways

Surface and dimensions ^a	Non-precision approach runways		
	Code number		
(1)	1 or 2 (2)	3 (3)	4 (4)
CONICAL			
Slope	5%	5%	5%
Height above the inner horizontal surface	60 m	75 m	100 m
INNER HORIZONTAL			
Height	45 m	45 m	45 m
Radius	3 500 m	4 000 m	4 000 m
APPROACH			
Length of inner edge	150 m	300 m	300 m
Distance from threshold	60 m	60 m	60 m
Divergence (each side)	15%	15%	15%
First section			
Length	2 500 m	3 000 m	3 000 m
Slope	3.33%	2%	2%
Second section			
Length	Not applicable	3 600 m ^b	3 600 m ^b
Slope	–	2.5%	2.5%
Horizontal section			
Length	Not applicable	8 400 m ^b	8 400 m ^b
Total length	–	15 000 m	15 000 m
TRANSITIONAL			
Slope	20%	14.3%	14.3%
a. All dimensions are measured horizontally unless specified otherwise.			
b. Variable length (see GAR 1.G015 (c)).			

(e) New objects or extensions of existing objects shall not be permitted above the approach surface beyond 3000 m from the inner edge, the conical surface or inner horizontal surface except when, in the opinion of the appropriate authority, the object would be shielded by an existing immovable object, or after an aeronautical study it is determined that the object would not adversely affect the safety.

(f) Existing objects above any of the surfaces required by GAR 1.G015 (a) shall be removed except when, in the opinion of the appropriate authority, the object is shielded by an existing immovable object, or after an aeronautical study it is determined that the object would not adversely affect the safety.

GAR 1.G020 Obstacle limitation requirements for precision approach runways

(See ACJ ACJ-GAR (IEM) 1.G020 and Appendix 2 to ACJ-GAR (IEM) 1.G020 (h))

(a) The following obstacle limitation surfaces shall be established for precision approach runway categories I,

II or III.

- (1) Conical surface;
- (2) Inner horizontal surface;
- (3) Approach surface and inner approach surface;
- (4) Transitional surfaces;
- (5) Inner transitional surfaces; and
- (6) Balked landing surface.

(b) The heights and slopes of the surfaces shall not be greater than, and their other dimensions not less than, those specified in Table GAR 1.G020, except in the case of the horizontal section of the approach surface (see GAR 1.G020 Obstacle limitation requirements for precision approach runways (c)).

(c) The approach surface shall be horizontal beyond the point at which the 2.5 per cent slope intersects:

(1) a horizontal plane 150 m above the threshold elevation; or

(2) the horizontal plane passing through the top of any object that governs the obstacle clearance limit;

whichever is the higher.

(d) Fixed objects shall 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, must be located on the strip. Mobile objects shall not be permitted above these surfaces during the use of the runway for landing.

(e) New objects or extensions of existing objects shall

not be permitted above an approach surface or a transitional surface except when, in the opinion of the appropriate authority, the new object or extension would be shielded by an existing immovable object.

(f) New objects or extensions of existing objects shall not be permitted above the conical surface and the inner horizontal surface except when, in the opinion of the appropriate authority, an object would be shielded by an existing immovable object, or after an aeronautical study it is determined that the object would not adversely affect the safety.

(g) Existing objects above an approach surface, a transitional surface, the conical surface and inner horizontal surface shall be removed, except when, in the opinion of the appropriate authority, an object is shielded by an existing immovable object, or after an aeronautical study it is determined that the object would not adversely affect the safety.

Table GAR 1.G020 Dimensions and slopes of obstacle limitation surfaces –Precision approach runways

Surface and dimensions ^a (1)	Precision approach runways		
	Category I Code number		Category II or III Code number
	1 or 2 (2)	3 or 4 (3)	3 or 4 (4)
CONICAL			
Slope	5%		5%
Height	60 m		100 m
INNER HORIZONTAL			
Height	45 m		45 m
Radius	3 500 m		4 000 m
INNER APPROACH			
Width	90 m		120 m ^c
Distance from threshold	60 m		60 m
Length	900 m		900 m
Slope	2.5%		2%
APPROACH			
Length of inner edge	150 m		300 m
Distance from threshold	60 m		60 m
Divergence (each side)	15%		15%
First section			
Length	3 000 m		3 000 m
Slope	2.5%		2%
Second section			
Length	12 000 m		3 600 m ^b
Slope	3%		2.5%
Horizontal section	Not applicable		
Length			8 400 m ^b
Total length	15 000 m		15 000 m
TRANSITIONAL			
Slope	14.3%		14.3%
INNER TRANSITIONAL			
Slope	40%		33.3%
BALKED LANDING SURFACE			
Length of inner edge -	90 m		120 m ^c
Distance from threshold	^c		1 800 m ^d
Divergence (each side)	10%		10%
Slope	4%		3.33%

a. All dimensions are measured horizontally unless specified otherwise.
b. Variable length (see GAR 1.G020 (c)).
c. Distance to the end of strip.
d. Or end of runway whichever is less.
e. Where the code letter is F (Table GAR 1.B030), the width is increased to 155 m.

(h) Obstacle-Free Zone (OFZ)

(1) Together, the inner approach, inner transitional and balked landing surfaces define the obstacle-free zone (OFZ).

(see Figure 1.G035 (b) and Figure 1.G035 (c))

(2) This zone shall be kept free from fixed objects, other than lightweight frangible mounted aids to air navigation, which must be near the runway to perform their function, and from transient objects such as aircraft and vehicles when the runway is being used for category II, or III ILS approaches. When an OFZ is established for a precision approach runway category I, it shall be clear of such objects when the runway is used for category I approaches.

GAR 1.G025 Obstacle limitation requirements for runways meant for take-off

(See ACJ ACJ-GAR (AMC) 1.G025)

(a) The following obstacle limitation surface shall be established for a runway meant for take-off: Take-off climb surface

(b) The dimensions of the surface shall not be less than the dimensions specified in Table GAR 1.G025, except that a lesser length may be adopted for the take-off climb surface where such lesser length would be consistent with procedural measures adopted to govern the outward flight of aeroplanes.

Table GAR 1.G025 Dimensions and slopes of obstacle limitation surfaces – Runways meant for take-off

Surface and dimensions ^a	Runways meant for take-off		
	Code number		
(1)	1	2	3 or 4
	(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	1 200 m 1 800 m ^c
Length	1 600 m	2 500 m	15 000 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. 1 800 m when the intended track includes changes of heading greater than 15° for operations conducted in IMC, VMC by night.

d. See GAR 1.G025 (c).

(c) The operational characteristics of aeroplanes for which the runway is intended shall be examined to see if it is desirable to reduce the slope specified in Table GAR 1.G025 when critical operating conditions are to be catered to. If the specified slope is reduced, corresponding adjustment in the length of take-off climb surface shall be made so as to provide protection to a height of 300 m. (See ACJ-GAR (AMC) 1.025 (c))

(d) New objects or extensions of existing objects shall not be permitted above a take-off climb surface except when, in the opinion of the appropriate authority, the new object or extension would be shielded by an existing immovable object.

(e) Existing objects that extend above a take-off climb surface shall be removed except when, in the opinion of the appropriate authority, an object is shielded by an existing immovable object, or after an aeronautical study it is determined that the object would not adversely affect the safety.

GAR 1.G030 Limitations of other objects

See ACJ-GAR (IEM) 1.030 Limitations of other objects

(a) Objects which do not project through the approach surface but which would nevertheless adversely affect the optimum sitting or performance of visual or non-visual aids shall, as far as practicable, be removed.

(b) Any other object below the vertical limits of obstacle limitation surfaces which in the opinion of the appropriate authority after aeronautical study, endanger aeroplanes on the movement area or in the air within the horizontal limits of the obstacle limitation surfaces and protection surfaces shall be regarded as an obstacle and shall be removed.

(c) If it is of particular importance for safe operation on circuits, on arrival routes towards the airport or on departure or missed approach climb-paths, appropriate authority shall for non-precision approach runways and for precision approach runways establish outer horizontal surface.

GAR 1.G035 Obstacle limitation surfaces : general points

(See ACJ ACJ-GAR (IEM) 1.035)

See Figure 1.G035 (a), Figure 1.G035 (b), Figure 1.G035 (c), Figure 1.G035 (d) and Figure 1.G035 (e).

GAR 1.G040 Inner horizontal surface

(See ACJ-GAR (IEM) 1.040 (b) and GAR (IEM) 1.040 (c))

(a) Description.- Inner horizontal surface. A surface located in a horizontal plane above an aerodrome and its environs.

(b) Characteristics.- The outer limits of the inner horizontal surface are defined by circular arcs centred on the intersection of the extended RWY centre line with the end of the RWY strip joined tangentially by straight lines. (See Figure 1.G035 (d) and Figure 1.G035 (e)).

(See ACJ-GAR (AMC) 1.040 (b) Inner horizontal surface)

(c) The height of the inner horizontal surface shall be measured above an elevation datum established by the national aviation authority for such purpose. (See ACJ-GAR (IEM) 1.040 (c) Inner horizontal surfaces)

GAR 1.G045 Conical surface

(a) Description.- Conical surface. A surface sloping upwards and outwards from the periphery of the inner horizontal surface.

(b) Characteristics.- The limits of the conical surface shall comprise:

(1) a lower edge coincident with the periphery of the inner horizontal surface; and

(2) an upper edge located at a specified height above the inner horizontal surface.

(c) The slope of the conical surface shall be measured

in a vertical plane perpendicular to the periphery of the inner horizontal surface.

GAR 1.G050 Outer horizontal surface

(See ACJ ACJ-GAR (IEM) 1.G050)

(a) Characteristics: Where an aeronautical study indicates that it is necessary to establish the outer horizontal surface, the appropriate authority shall define the outer limits of the surface.

(b) Description: A horizontal surface connected to the upper edge of conical surface and spreading/stretching outwards.

GAR 1.G055 Approach surface

(a) Description.- Approach surface. An inclined plane or combination of planes preceding the threshold.

(b) Characteristics.- The limits of the approach surface shall comprise:

(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.

The above surfaces shall be varied when lateral offset, offset or curved approaches are utilized, specifically, two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the lateral offset, offset or curved ground track.

(c) The elevation of the inner edge shall be equal to the elevation of the mid-point of the threshold.

(d) The slope(s) of the approach surface shall be measured in the vertical plane containing the centre line of the runway and shall continue containing the centre line of any lateral offset or curved ground track.

GAR 1.060 Inner approach surface

(a) Description.- Inner approach surface. A rectangular portion of the approach surface immediately preceding the threshold.

(b) Characteristics.- The limits of the inner approach surface shall comprise:

(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.

GAR 1.G065 Transitional surface

(See ACJ ACJ-GAR (IEM) 1.G065)

(a) Description.- Transitional surface. A complex surface along the side of the strip and part of the side of the approach surface, that slopes upwards and outwards to the inner horizontal surface.

(b) Characteristics.- The limits of a transitional surface shall comprise:

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

(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. (See ACJ-GAR (IEM) 1.065(c)(2) Transitional surface)

(d) The slope of the transitional surface shall be measured in a vertical plane at right angles to the centre line of the runway.

Figure 1.G035 (a). Obstacle limitation surfaces

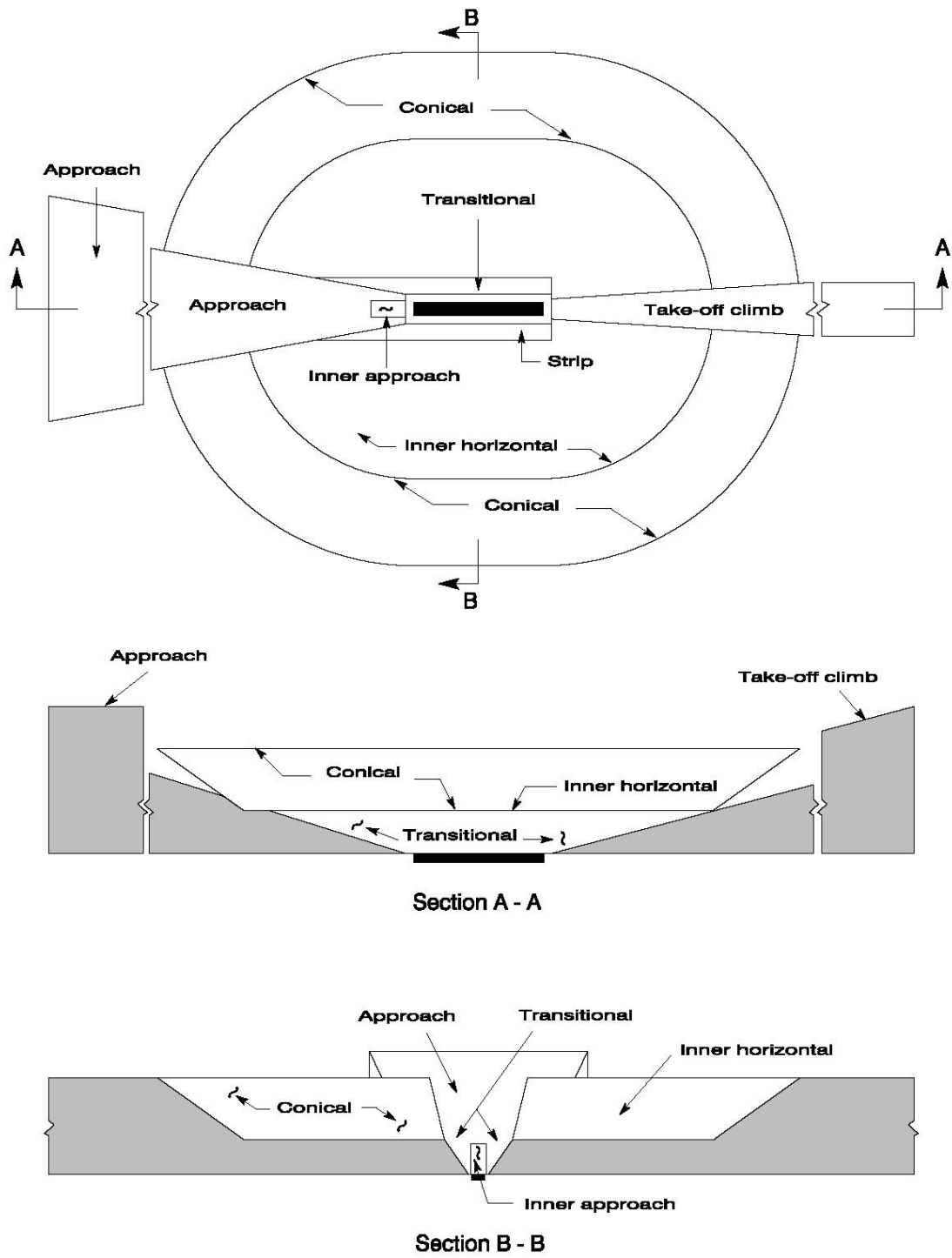


Figure G035 (b). Inner approach, inner transitional and balked landing obstacle limitation surfaces

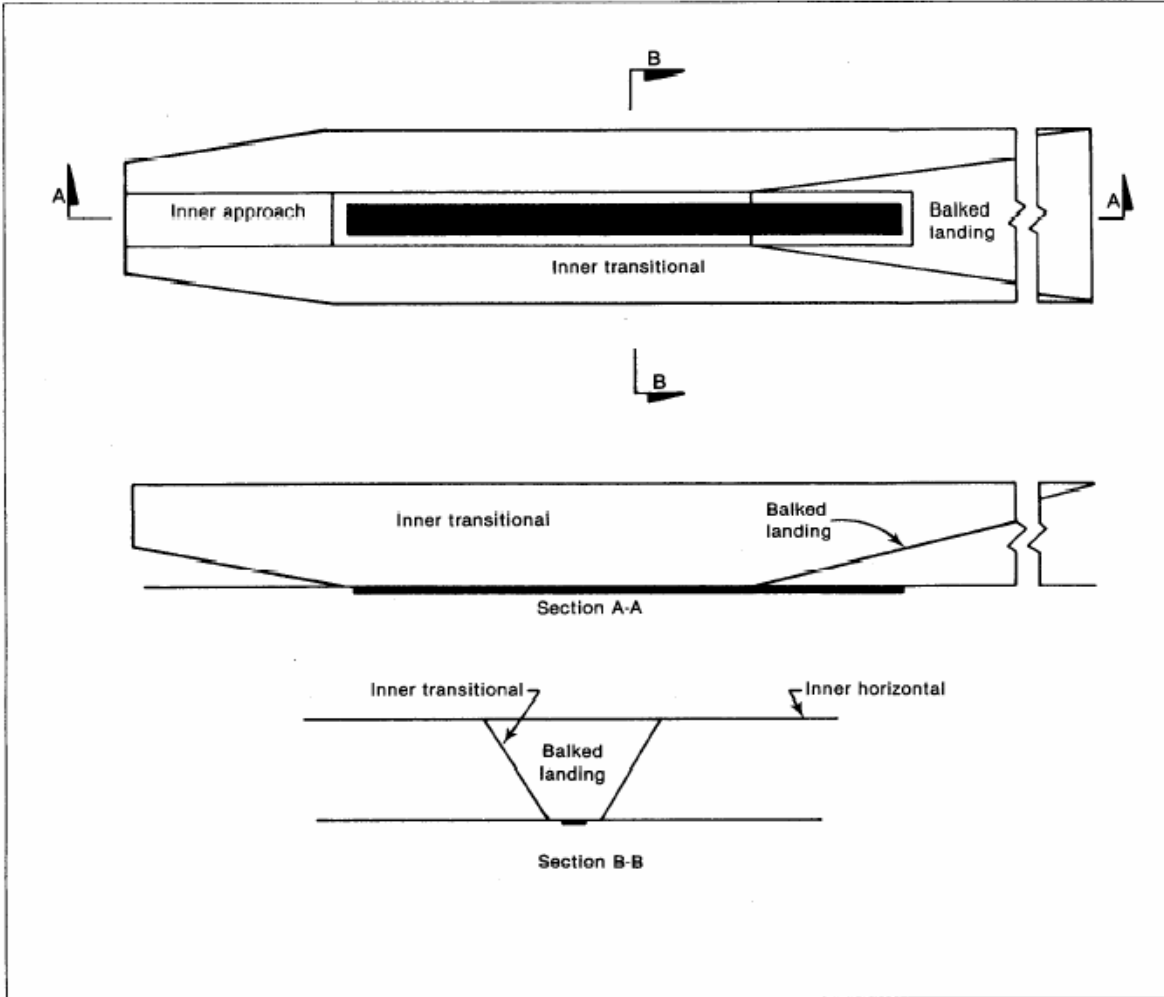


Figure 1.G035 (c). Inner approach, inner transitional and balked landing obstacle limitation surfaces

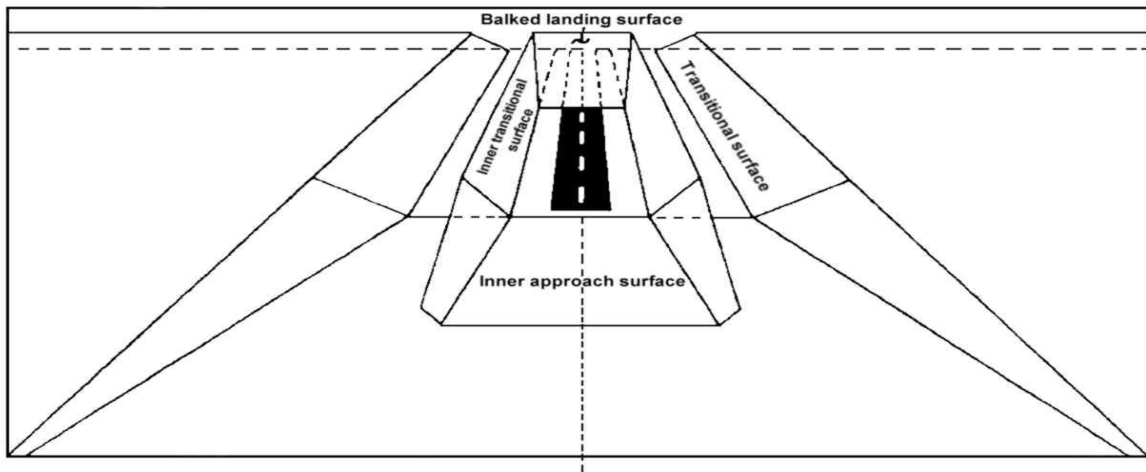


Figure 1.G035 (d). Inner horizontal surface for a single runway (where the runway code number is 4)

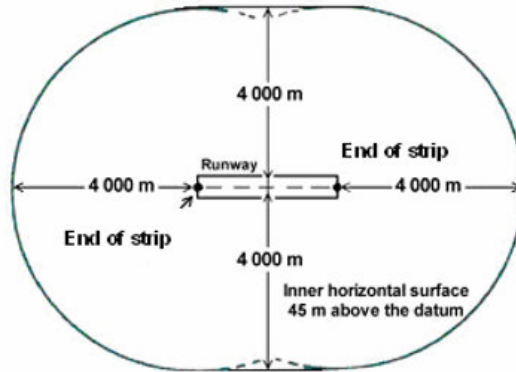
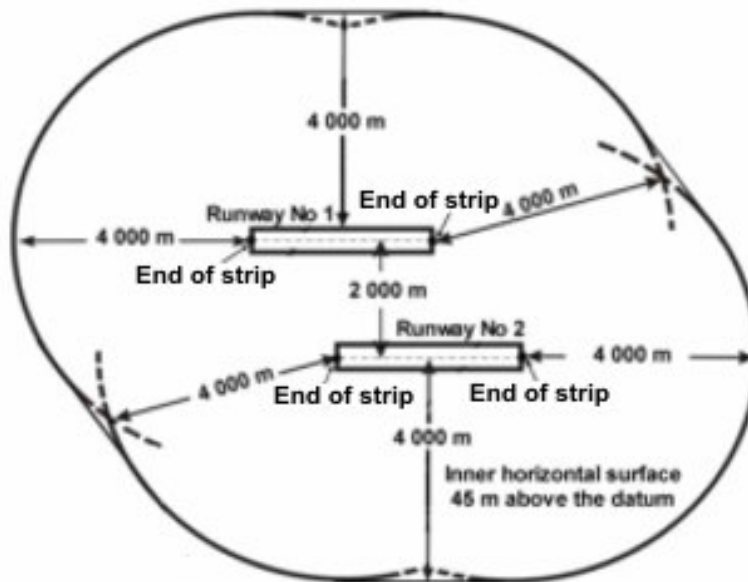


Figure 1.G035 (e). Composite inner horizontal surface for two parallel runways (where the runway code number is 4)



GAR 1.G070 Inner transitional surface

(See ACJ ACJ-GAR 1.G070)

(a) Description.- Inner transitional surface. A surface similar to the transitional surface but closer to the runway.

(b) Characteristics.- The limits of an inner transitional surface shall comprise:

(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.

(c) The elevation of a point on the lower edge shall be:

(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.

(See ACJ-GAR (AMC) 1.070 Inner Transitional surface)

(d) The slope of the inner transitional surface shall be measured in a vertical plane at right angles to the centre line of the runway.

GAR 1.G075 Balked landing surface

(a) Description.- Balked landing surface. An inclined plane located at a specified distance after the threshold, extending between the inner transitional surface.

(b) Characteristics.- The limits of the balked landing surface shall comprise:

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

(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.

(c) The elevation of the inner edge shall be equal to the elevation of the runway centre line at the location of the inner edge.

(d) The slope of the balked landing surface shall be measured in the vertical plane containing the centre line of the runway.

GAR 1.G080 Take-off climb surface

(a) Description.- Take-off climb surface. An inclined plane or other specified surface beyond the end of a runway or clearway.

(b) Characteristics.- The limits of the take-off climb surface shall comprise:

(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) The elevation of the inner edge shall be 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 shall be equal to the highest point on the ground on the centre line of the clearway.

(d) In the case of a straight take-off flight path, the slope of the take-off climb surface shall be measured in the vertical plane containing the centre line of the runway.

(e) In the case of a take-off flight path involving a turn, the take-off climb surface shall be a complex surface containing the horizontal normals to its centre line, and the slope of the centre line shall be the same as that for a straight take-off flight path.

GAR 1.G085 Protection surface

(See GAR 1.007, Table GAR 1.G085, Figure GAR 1.G085 and ACJ ACJ-GAR (IEM) 1.G085)

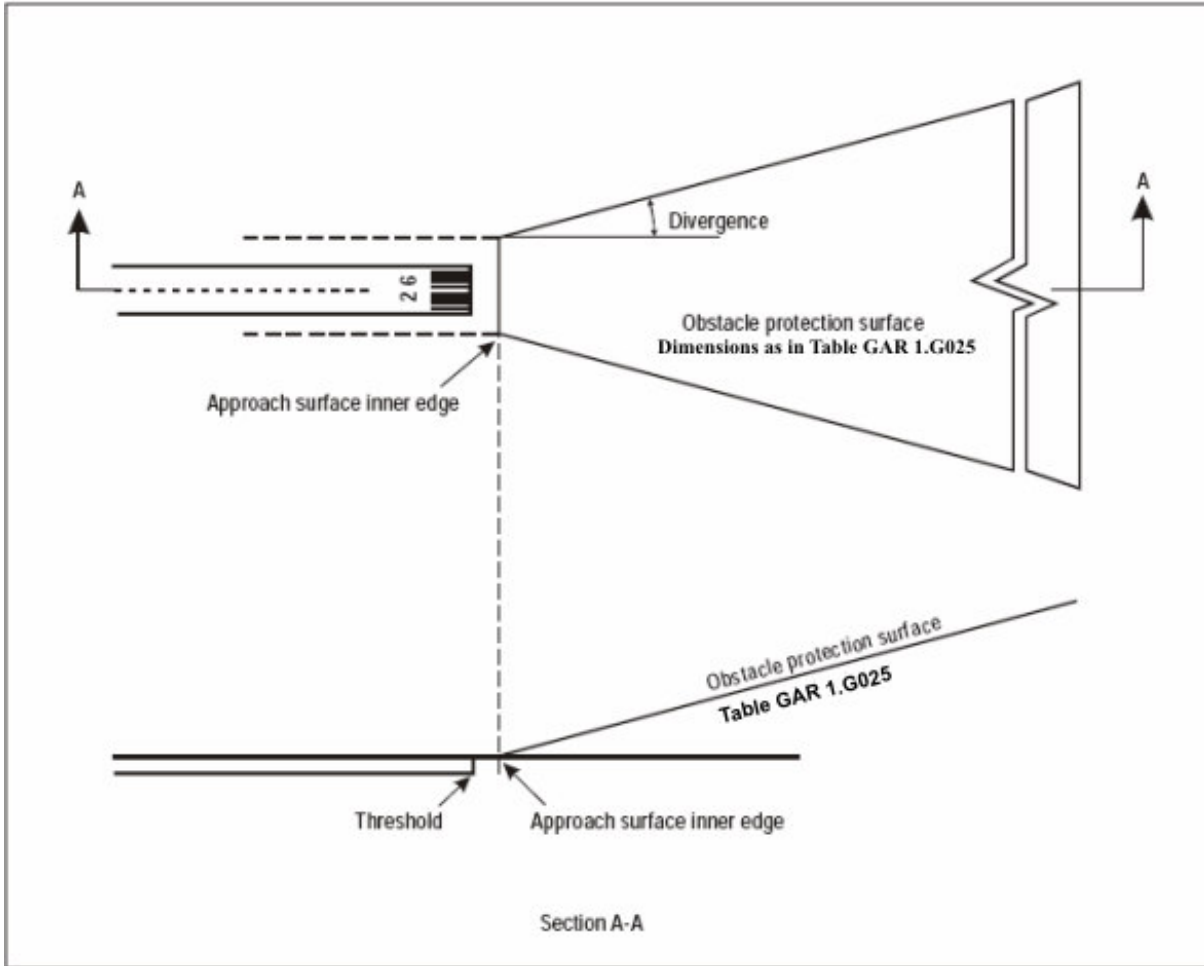
(a) The characteristics of the obstacle protection surface, i.e. origin, divergence, length and slope shall correspond to those specified in the relevant column of Table GAR 1.G085 Dimensions and slopes of obstacle protection surface and in Figure GAR 1.G085 Obstacle protection surface for visual approach slope indicator systems.

Table GAR 1.G085 Dimensions and slopes of obstacle protection surface

Surface dimensions	Runway type/code number							
	Non-instrument				Instrument			
	Code number				Code number			
	1	2	3	4	1	2	3	4
Length of inner edge	60 m	80 m ^a	150 m	150 m	150 m	150 m	300 m	300 m
Distance from threshold	30 m	60 m	60 m	60 m	60 m	60 m	60 m	60 m
Divergence (each side)	10%	10%	10%	10%	15%	15%	15%	15%
Total length	7 500 m	7 500 m ^b	15 000 m	15 000 m	7 500 m	7 500 m ^b	15 000 m	15 000 m
<i>Slope</i>								
a) T-VASIS and AT-VASIS	– ^c	1.9°	1.9°	1.9°	–	1.9°	1.9°	1.9°
b) PAPT ^d	–	A–0.57°	A–0.57°	A–0.57°	A–0.57°	A–0.57°	A–0.57°	A–0.57°
c) APAPT ^d	A–0.9°	A–0.9°	–	–	A–0.9°	A–0.9°	–	–

a. This length is to be increased to 150 m for a T-VASIS or AT-VASIS.
b. This length is to be increased to 15 000 m for a T-VASIS or AT-VASIS.
c. No slope has been specified if a system is unlikely to be used on runway type/code number indicated.
d. Angles as indicated in Figure

Figure GAR 1.G085 Obstacle protection surface for visual approach slope indicator systems.



SECTION 2

SUBPART G - OBSTACLE RESTRICTION AND REMOVAL

ACJ-GAR (IEM) 1.G001 Applicability

See GAR 1.G001 Applicability

Although this regulation is focused only on safety there are several requirements in Subpart G where regularity is taken into account. There are several aspects influencing regularity, which could have a significant impact on safety:

- Airport capacity constraints
- Use of airspace
- Obstacles that adversely affect RWY declared distances
- Obstacles that adversely affect aircraft take-off and landing performance
- Obstacles adversely affecting performance of visual and radio navigation aids

With increase in traffic volume all these aspects can play a major role (pressure from industry to increase capacity or optimise STARs and SIDs). In many cases it is therefore desirable to keep airspace around aerodromes free of obstacles for the future development.

The obstacle limitation surfaces described in this Subpart do not protect the obstacle assessment surfaces related to Instrument Flight Procedures designed according to ICAO Doc. 8168. OPS/611 Vol II.

Objects that penetrate the obstacle limitation surfaces contained in this Subpart may in certain circumstances cause an increase in the obstacle clearance altitude/height for an instrument approach procedure or any associated visual circling procedure. Criteria for evaluating obstacles are contained in the ICAO Procedures for Air Navigation Services –Aircraft Operations (PANS-OPS) (Doc 8168).

The surfaces in ICAO Doc. 8168 OPS/611 Vol. II are intended for assessing the impact of obstacles on the obstacle clearance height, which in turn is used for determining approach minima and ensuring that an acceptable safety level is achieved. In order to avoid increased operational minima and consequently reduce aerodrome utilization, there may be a need for more stringent obstacle limitation surfaces than those described in this Subpart.

The establishment of, and requirements for, an obstacle protection surface for visual glide slope systems are specified in Subpart J "Visual aids" GAR 1.J160 Obstacle protection surface for T-VASIS, AT-VASIS, PAPI and APAPI.

For other objects outside the horizontal limits of obstacle limitation surface that could influence flight operation safety refer to Subpart Q.

ACJ-GAR (IEM) 1.G001 d) Aeronautical study

See GAR 1.G001 d)

Aeronautical study

The aim of the specifications in GAR1 is to give aerodrome planners a tool to design efficient aerodromes for safe aircraft operations. It may be permissible to operate at existing aerodromes with lower criteria than the GAR specifies if an aeronautical study indicates that such lower criteria would not adversely affect the safety or significantly affect the regularity of operations of aircraft. The prime objective of an aeronautical study is to assess the adequacy of the protection provided by the existing measures and to assess whether further mitigation is required. This may result in operational limitations or restrictions.

Notwithstanding the above, every effort must be made to conform to the GAR specifications at the earliest opportunity.

ACJ-GAR (IEM) 1.005

Obstacle limitation requirements : general points

See GAR 1.G005 Obstacle limitation requirements : general points

The requirements for obstacle limitation surfaces are specified on the basis of the intended use of a runway, i.e. take-off or landing and type of approach, and are intended to be applied when such use is made of the runway. In cases where operations are conducted to or from both directions of a runway, then the function of certain surfaces may be nullified

of more stringent requirements of another lower surface. This does not mean that these surfaces do not need to be established.

Overview:

Type of object	Restriction	Runway		
		Non-instrument	Non-precision	Precision
New objects / extensions to existing objects	Not permitted above	Take-off ^a Approach ^a Transitional ^a Conical ^b Inner horizontal ^b	Take-off ^a Approach < 3000m ^a Transitional ^a Approach > 3000m ^b Conical ^b Inner horizontal ^b	Take-off ^a Approach ^a Transitional ^a Conical ^b Inner horizontal ^b
Existing objects	To be removed as far as practicable	Approach ^b Transitional ^b Conical ^b Inner horizontal ^b	Approach ^b Transitional ^b Conical ^b Inner horizontal ^b	Approach ^b Transitional ^b Conical ^b Inner horizontal ^b
Fixed objects <i>Except when necessary function and frangible</i>	Not permitted above	Not applicable	Not applicable	Inner approach Inner transitional Balked landing
Mobile objects <i>During use for landing</i>	Not permitted above	Not applicable	Not applicable	Inner approach Inner transitional Balked landing
^a Except when shielded				
^b Except when shielded or aeronautical study				

ACJ-GAR (IEM) 1.G010

Obstacle limitation requirements for non-instrument runways and non-precision approach runways

See GAR 1.G010 (c) & GAR 1.G015 (d) and Appendix 1

- 1 Circumstances in which the shielding principle may reasonably be applied are described in Appendix No. 1
- 2 Because of transverse or longitudinal slopes on a strip, in certain cases the inner edge or portions of the inner edge of the approach surface may be below the corresponding elevation of the strip. It is not intended that the strip be graded to conform with the inner edge of the approach surface, nor is it intended that terrain or objects which are above the approach surface beyond the end of the strip, but below the level of the strip, be removed unless it is considered they may endanger aeroplanes.

ACJ-GAR (IEM) 1.G015

Obstacle limitation requirements for non-precision approach runways

See GAR 1.G015 Obstacle limitation requirements for non-precision approach runways

ACJ-GAR (IEM) 1.G020

Obstacle limitation requirements for precision approach runways

See GAR 1.G020 Obstacle limitation requirements for precision approach runways and Appendix 2

- 1 See Subpart K GAR 1.K025 Siting of equipment and installations on operational areas for information regarding siting and construction of equipment and installations on operational areas.
- 2 Because of transverse or longitudinal slopes on a strip, in certain cases, the inner edge or portions of the inner edge of the approach surface may be below the corresponding elevation of the strip. It is not intended that the strip be graded to conform with the inner edge of the approach surface, nor is it intended that terrain or objects which are above the approach surface beyond the end of the strip, but below the level of the strip, be removed unless it is considered they may endanger aeroplanes.

ACJ-GAR (AMC) 1.G025 (c)

Obstacle limitation requirements for runways meant for take-off

See GAR 1.G025 (c) Obstacle limitation requirements for runways meant for take-off

When local conditions differ widely from sea level standard atmospheric conditions, it may be advisable for the slope specified in Table GAR 1.G025 to be reduced. The degree of this reduction depends on the divergence between local conditions and sea level standard atmospheric conditions, and on the performance characteristics and operational requirements of the aeroplanes for which the runway is intended.

If no object reaches the 2 per cent (1:50) take-off climb surface, new objects should be limited to preserve the existing obstacle free surface down to a slope of 1.6 per cent (1:62.5).

ACJ-GAR (IEM) 1.030

Limitations of other objects

See GAR 1.030 Limitations of other objects

In certain circumstances, objects that do not project above any of the surfaces enumerated in GAR 1.010, GAR 1.015, GAR 1.020 and GAR 1.025 may constitute a hazard to aeroplanes as, for example, where there are one or more isolated objects in the vicinity of an aerodrome.

ACJ-GAR (IEM) 1.G035

Obstacle limitation surfaces : general points

See GAR 1.G035 Obstacle limitation surfaces : general points

Because of transverse slopes on a strip or clearway, in certain cases portions of the inner edge of the take-off climb surface may be below the corresponding elevation of the strip or clearway. It is not intended that the strip or clearway be graded to conform with the inner edge of the take-off climb surface, nor is it intended that terrain or objects which are above the take-off climb surface beyond the end of the strip or clearway, but below the level of the strip or clearway, be removed unless it is considered they may endanger aeroplanes. Similar considerations apply at the junction of a clearway and strip where differences in transverse slopes exist.

ACJ-GAR (IEM) 1.G040 (b)

Inner horizontal surface

See GAR 1.G040 (b) Inner horizontal surfaces

1 The shape of the inner horizontal surface need not necessarily be circular. Although, the inner horizontal surface was originally defined as a circle with its centre at the airport reference point.

As airports grew larger and runway patterns became more complex, this circle proved inadequate, and efforts were made to describe a larger surface by designating a secondary reference point and constructing an elliptical surface based on the two reference points as foci.

2 More recently, it has been found preferable to designate a reference point at or near each runway end. These reference points are usually located at the end of the runway strip (60 m from the runway end where the runway code number is 3 or 4) and on the extended runway centre line. The inner horizontal surface is then constructed by striking an arc of the proper radius from each such reference point. The boundary of the surface is completed by straight lines tangent to adjacent arcs. Such a surface is illustrated in Figure 1.G035 (d) and Figure 1.G035 (e). The conical surface then originates from the periphery of the surface so constructed.

ACJ-GAR (IEM) 1.G040 (c)

Inner horizontal surface

See GAR 1.G040 (c) Inner horizontal surface

Selection of the datum should take account of:

- a) the elevations of the thresholds; the elevation of the aerodrome reference point and the elevation of the terrain surrounding the aerodrome within the (complex) inner horizontal surface;
- b) minimum circling altitudes in use or required; and
- c) the nature of operations at the airport.

For relatively level runways the choice of datum is not critical, but when the thresholds differ by more than 6 m, the datum selected should have particular regard to the factors above.

For complex inner horizontal surfaces a common elevation is not essential, but where surfaces overlap the lower surface should be regarded as dominant in its function of avoiding the establishment of new obstacles.

Where significant differences exist between runway end elevations (of 6 m or more), it would be desirable to establish the elevation of the inner horizontal surface 45 m above the lowest reference point elevation to provide a greater margin of safety.

The transitional surface, inner transitional surface and balked landing surface should extend to that elevation. All objects penetrating this inner horizontal surface should be taken into consideration for the purpose of the procedure design and determination of minimum circling altitude.

ACJ-GAR (IEM) 1.G050

Erection of tall structures in the vicinity of aerodromes

See GAR 1.G050 Outer horizontal surface

1 In the experience of some States, significant Operational problems can arise from the erection of tall structures in the vicinity of airports beyond the areas currently recognized in this Subpart as areas in which restriction of new construction may be necessary. The operational implications fall broadly under the headings of safety and efficiency.

2 Safety implications.

It is particularly desirable to review carefully any proposal to erect high masts or other skeletal structures in areas, which would otherwise be suitable for use by aircraft on wide visual circuits, on arrival routes towards the airport or circuit, or on departure or missed approach climb-paths. Avoidance by marking or lighting cannot be relied upon in view of the relatively inconspicuous character of these structures, especially in conditions of reduced visibility, and notification of their existence will similarly not always guarantee avoidance.

3 Efficiency implications.

If tall structures are erected in or near areas otherwise suitable for instrument approach procedures, increased procedure heights may need to be adopted, with consequent adverse effects on regularity and on the duration of the approach procedure, such as the denial of useful altitude allocations to aircraft in associated holding patterns. Such structures may furthermore limit desirable flexibility for radar vectored initial approaches and the facility to turn en route during the departure climb or missed approach.

4 In view of these potentially important operational considerations, authorities may consider it desirable to adopt measures to ensure that they have advance notice of any proposals to erect tall structures. This will enable them to study the aeronautical implications and take such action as maybe at their disposal to protect aviation interests. In assessing the operational effect of proposed new construction, tall structures would not be of immediate significance if they are proposed to be located in:

- a) an area already substantially obstructed by terrain or existing structures of equivalent height; and
- b) an area which would be safely avoided by prescribed procedures associated with navigational guidance when appropriate.

5 As a broad specification for the outer horizontal surface, tall structures can be considered to be of possible significance if they are both higher than 30 m above local ground level, and higher than 150 m above aerodrome elevation within a radius of 15 000 m of the centre of the airport where the runway code number is 3 or 4. The area of concern may need to be extended to coincide with the obstacle-accountable areas of PANS- OPS for the individual approach procedures at the airport under consideration provided to ensure that defied approach and missed approach paths will be followed.

ACJ-GAR (IEM) 1.G065 (c)(2)

Transitional surface

See GAR 1.G065 (c)(2)

As a result of GAR 1.065 (c)(2) the transitional surface along the strip will be curved if the runway profile is curved, or a plane if the runway profile is a straight line. The intersection of the transitional surface with the inner horizontal surface will also be a curved or a straight line depending on the runway profile.

ACJ-GAR 1.G070

Inner transitional surface

See GAR 1.G070 (c)(2) Inner transitional surface

1 It is intended that the inner transitional surface be the controlling obstacle limitation surface for navigation aids, aircraft and other vehicles that must be near the runway and which is not to be penetrated except for frangible objects. The transitional surface described in GAR 1.G070 (f) is intended to remain as the controlling obstacle limitation surface for buildings, etc.

2 As a result of GAR 1.G070 (c)(2), the inner transitional surface along the strip will be curved if the runway profile is curved or a plane if the runway profile is a straight line. The intersection of the inner transitional surface with the inner horizontal surface will also be a curved or straight line depending on the runway profile.

Appendix 1 to ACJ-GAR (IEM) 1.G010 (c) & ACJ-GAR (IEM) 1.G015 (d)

See ACJ-GAR (IEM) 1.G010 (c) & ACJ-GAR (IEM) 1.G015 (d)

1 The principle of shielding is employed to permit a more logical approach to restricting new construction and prescribing obstacle marking and lighting. It also reduces the number of cases of new construction requiring review by authorities. Shielding principles are employed when some object, an existing building or natural terrain, already penetrates above one of the obstacle limitation surfaces described in Subpart G Section 1. If it is considered that the nature of an object is such that its presence may be described as permanent, then additional objects within a specified area around it may be permitted to penetrate the surface without being considered as obstacles. The original obstacle is considered as dominating or shielding the surrounding area.

2 The formula for shielding should be based on a horizontal plane projected from the top of each obstacle away from the runway and a plane with a negative slope of 10 per cent towards the runway. Any object, which is below either of the two planes, would be considered shielded. The permission to allow objects to penetrate an obstacle limitation surface under the shielding principle should, however, be qualified by reference to the need for an aeronautical study in all cases.

3 The shielding effect of immovable obstacles laterally in approach and take-off climb areas is more uncertain. In certain circumstances, it may be advantageous to preserve existing unobstructed cross-section areas, particularly when the obstacle is close to the runway. This would guard against future changes in either approach or take-off climb area specifications or the adoption of a turned take-off procedure.

4 The permanency of the immovable obstacle, which is to be considered as shielding an area, should be given very careful review. An object should be classed as immovable only if, when taking the longest view possible, there is no prospect of removal being practicable, possible or justifiable, regardless of how the pattern, type or density of air operations might change.

5 In use, the methods for determining the extent of area shielded by a permanent obstacle and permissible height limits around it vary between States. It has often been found difficult to apply firm policies on this matter, and generally an aeronautical study is carried out to review the exact effect the construction of a new object will have. To give some guidance on alternative shielding concepts, the practices of several selected States are given in ICAO Doc 9137, Part 6, Appendix 3, States Practices on Shielding.

Appendix 2 to ACJ-GAR (IEM) 1.G020 (h) (Obstacle limitation requirements for precision approach runways)

See ACJ-GAR (IEM) 1.G020 (h)

1 Purpose of OFZ for code number 3 or 4 (IEM)

1.1 The OFZ provided on a precision approach runway where the code number is 3 or 4 is designed to protect an aeroplane with a wingspan of 60 m on a precision approach below a height of 30 m having been correctly aligned with the runway at that height, to climb at a gradient of 3.33 per cent and diverge from the runway centre line at a splay no greater than 10 per cent.

1.2 Assumptions:

The gradient of 3.33 per cent is the lowest permitted for an all-engine-operating balked landing.

A horizontal distance of 1 800 m from threshold to the start of the balked landing surface assumes that:

- the latest point for a pilot to initiate a balked landing is the end of the touchdown zone lighting,
- and that changes to aircraft configuration to achieve a positive climb gradient will normally require a further distance of 900 m, which is equivalent to a maximum time of about 15 s.

A slope of 33.33 per cent for the inner transitional surfaces results from a 3.33 per cent climb gradient with a splay of 10 per cent. The splay of 10 per cent is based upon recorded dispersion data in programmes conducted by two States.

2 Purpose of OFZ for code number 3 or 4 (IEM)

2.1 The OFZ for a precision approach runway category I where the code number is 1 or 2 is designed to protect an aeroplane with a wing span of 30 m to climb at a gradient of 4 per cent and diverge from the runway centre line at a splay no greater than 10 per cent.

2.2 Assumptions:

The gradient of 4 per cent is that of the normal take-off climb surface for these aeroplanes. When allied to a 10 per cent splay, it results in a slope for the inner transitional surfaces of 40 per cent. The balked landing surface originates at 60 m beyond the far end of the runway from threshold and is coincident with the take-off climb surface for the runway.