ETHIOPIAN CIVIL AVIATION AUTHORITY

Aerodrome Safety and Standards Directorate

Control of Obstacle

2014

PREAMBLE

WHEREAS, it is desirable to consolidate and modernize the aviation Advisory Circular to bring them to international standards,

WHEREAS, it is important to set the Advisory Circular as to how the regulatory, administrative, technical and supervisory activities of the Authority shall be performed in the one hand and setting the duties, obligations and standards that shall be respected by operators and aviation personnel,

WHEREAS, it is necessary, to provide detailed Advisory Circular for the administration of license, certification, investigation and enforcement of aviation laws.

NOW THEREBY, The Authority under its power given by Article 92/2 of the Civil Aviation Proclamation No. 616/2008 issued the following Advisory Circular.

1. SHORT TITLE

This Advisory Circular may be cited as "Advisory Circular for Control of Obstacle, No. ECAA-AC-AGA015/2014"

2. REPEAL AND INAPPLICABLE LAWS

No law, directive, order or practice shall, in so far as it is inconsistent with this Advisory Circular, be applicable with respect to matters provided for by this Advisory Circular.

3. EFFECTIVE DATE

This Advisory Circular shall come into force as of September/ 2014.

Done at Addis Ababa, September, 2014

Woeenyeleh Hunegnaw (Col.)
Director General

Ethiopian Civil Aviation Authority	**Advisory Circular ECAA-AC-AGA015** **September, 2014**

CONTROL OF OBSTACLES

1. Purpose

The purpose of this Advisory Circular (AC) is to provide guidance to aerodrome operators on the controlling of obstacles at and in the vicinity of aerodromes in order to comply with the requirements of the Ethiopian Civil Aviation Rules and Standards, 2013 part 12.

2. Introduction

The effective utilizations of an aerodrome may be influenced by natural features and manmade objects inside and outside the aerodrome boundary. Uncontrolled growth of such obstacles may result in

a) limitations on the distance available for take-off and landing;

b) the range of meteorological conditions in which take-off and landings can be undertaken; or

c) restriction in the payload, restrictions on certain types of aircraft and possible closure of aerodromes.

To ensure safety and efficiency of aircraft operations, certain areas of the local airspace must be regarded as integral parts of the aerodrome environment. The degree of freedom from obstacles in these areas is as important to the safe and efficient use of the aerodrome as are the more obvious physical requirements of the runways and their associated strip.

The criteria for controlling obstacles are based on Obstacle Limitation Surfaces (OLS) as detailed in the Aerodrome Manual of Implementing Standards.

3. Criteria for assessment of obstacles using the Manual of Aerodrome Standards Obstacle Limitation Surfaces

3.1. **General**

3.1.1. The broad purpose of the OLS is to define the volume of airspace that should ideally be kept free from obstacles in order to minimize the dangers presented by obstacles to aircraft, either during an entirely visual approach or during the visual segment of an instrument approach. The OLS are based on the aerodrome reference code and thus directly related to the critical aeroplane intended to operate at a particular aerodrome.

3.1.2. The OLS are intended to be of a permanent nature, and to be effective, the requirements are enacted in local Government laws. The surfaces established shall allow not only for existing operations, but also for the ultimate development envisaged for each aerodrome.

3.1.3. The OLS provided for the control of obstacles includes;

a) Outer Horizontal surface,
b) Inner Horizontal Surface,
c) conical surface,
d) approach surface,
e) transitional surfaces,
f) Inner Approach Surface,
g) Inner Transitional Surface, and
h) balked landing surface

3.2 Description of the Manual of Aerodrome Standards surfaces

3.2.1. Outer Horizontal Surfaces

3.2.1.1. Significant operational problems can arise from the erection of tall structures in the vicinity of aerodromes beyond the areas currently recognized in the Manual of Implementing Standards Aerodrome as areas in which restriction of new construction may be necessary. The operational implications fall broadly under the headings of safety and efficiency.

Safety implications: It is particularly desirable to review carefully any proposal to erect high mast 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.

Efficiency implications: If tall structures are erected in m near areas otherwise suitable for instrument approach procedures, increased procedure heights m y 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 m aircraft in associated holding patterns. Such structures may furthermore limit desirable flexibility far radar vectored initial approaches and the facility to turn en route during the departure climb or missed approach.

3.2.1.2. In view of these potentially important operational considerations, aerodrome operators are required 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 may be at their disposal to protect aviation interests.

3.2.1.3. 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 aerodrome 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 aerodrome under consideration.

3.2.2. Inner Horizontal Surface and Conical Surfaces

3.2.2.1. The purpose of the inner horizontal surface is to protect airspace for visual circling prior to landing, possibly after a descent through cloud aligned with a runway other than that in use for landing.

3.2.2.2. Whilst visual circling protection for slower aircraft using shorter runways may be achieved by a single circular inner horizontal surface, with an increase in speed it becomes essential to adopt a race-track pattern and use circular arcs centered on runway strip ends joined tangentially by straight lines. To protect two or more widely spaced runways, a more complex pattern could become necessary, involving four or more circular arcs.

3.2.2.3. To satisfy the intention of the inner horizontal surface, the aerodrome operator shall select a datum elevation from which the top elevation of the surface is determined.

Selection of the datum shall take account of;

a) the elevations of the most frequently used altimeter setting datum points;
b) minimum circling altitudes in use or required; and
c) the nature of operations at the aerodrome

3.2.2.4. 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.

3.2.3. Approach and Transitional Surfaces

3.2.3.1. Approach and Transitional Surfaces define the volume of airspace that should be kept free from obstacles to protect an aeroplane in the final phase of the approach-to-land manoeuvre.

3.2.3.2. The slopes and dimensions of approach and transitional surfaces will vary with the aerodrome reference code and whether the runway is used for visual, non-precision or precision approaches.

3.2.4. Inner Approach, Inner Transitional and Balked Landing Surfaces

3.2.4.1. Together, these surfaces define a volume of airspace in the immediate vicinity of a precision approach runway which is known as the obstacle-free zone (OFZ). This zone shall be kept free from fixed objects, other than lightweight frangible aids to air navigation which must be near the runway to perform their function, and from transient objects such as aircraft and vehicles 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 ILS approaches.

3.2.4.2. 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. The gradient of 3.33 per cent is the lowest permitted for an all-engine-operating balked landing. A horizontal distance of 1800 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 marking, 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 seconds. 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' I0 per cent.

The OFT or 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 a1 a gradient of 4 per cent and diverge from the runway centre line at a splay no greater than 10 per cent. 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 Tor 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

3.2.5. Take off Climb Surfaces

3.2.5.1. The take off and climb surface provides protection for an aircraft on take-off by indicating which obstacles should be removed if possible and marked or lighted if removal is impossible.

3.2.5.2. The dimensions and slopes will vary with the aerodrome reference code.

3.3. **Establishment of obstacle limitation surfaces**

3.3.1. The Aerodrome operators shall establish the obstacle limitation surfaces and provide to ECAA and local planning bodies (for use in developing height zoning limits) with pertinent information about the aerodrome, including:

a) location, orientation, length and elevation of all runways;
b) locations and elevations of all reference points used in establishing obstacle limitation surfaces;
c) proposed categories of runway use - non-instrument, non-precision approach or precision approach (category I, II or III)
d) plans for future runway extension or change in category

3.3.2. It would be desirable to base all obstacle limitation surfaces on the most critical aerodrome design features anticipated for future development, since it is always easier to relax a strict standard than to increase a requirement of a lesser standard if plans are changed. Some major aerodrome make a practice of attempting to protect ail runways to the standards required for category III precision approaches, to maintain maximum flexibility for future development.

4. Controlling obstacles at an Aerodrome

4.1. **Background**

4.1.1. When buildings encroach on the airspace needed for aircraft operations a conflict of interest arises between property owners and aerodrome operators. If such differences cannot be resolved it can be necessary for the Authority to establish restrictions limiting operations in the interest of safety. Such restrictions might take the form of requiring displaced thresholds (resulting in a reduction in effective runway length), higher weather minima for operations, reductions in authorized aircraft masses and possibly restrictions of certain aircraft types. Any of these actions could seriously affect orderly and efficient air transportation to an aerodrome and adversely affect the economy of the communities served by the aerodrome.

4.1.2. Control of obstacles in the vicinity of aerodromes is, therefore, a matter of interest and concern to Authority, aerodrome operators, local governments and communities and property owners. There are severe legal, economic, social and political limitations to what can be achieved by any of these interests with respect to an existing aerodrome where obstacles already exist. Every effort should be exerted by all interested parties to prevent erecting of future obstacles and to remove or lower existing obstacles.

4.2. **Legal authority and responsibility**

4.2.1. Pursuant to the Civil Aviation proclamation No. 616/2008 and the Ethiopian Civil Aviation Rules and Standards part 12, the Authority may impose prohibitions or restrictions on the use of land in the vicinity of aerodromes as may be necessary to ensure safe and efficient aircraft operations.

4.2.2. The ultimate responsibility for limitation and control of obstacles must, rest with the aerodrome operator. This includes the responsibility for controlling obstacles on aerodrome property and for arranging the removal or lowering of existing obstacles outside the aerodrome boundaries. The latter obligation can be met by negotiations leading to purchase or condemnation where authorized.

4.2.3. The aerodrome operators, local governments, planning agencies in collaboration with ECAA should develop height zoning regulations based on appropriate obstacle limitation surfaces, and limit future developments accordingly. The ECAA shall require aerodrome operator as well as property owners or developers to give formal notice of any proposed structure which may penetrate an obstacle limitation surface. Local bodies should co-operate closely with ECAA to ensure that the measures taken provide the greatest possible degree of safety and efficiency for aircraft operations.

4.2.4. The aerodrome operator shall designate a member of his staff to be responsible for monitoring the growth of obstacles at and in the vicinity of aerodromes and coordinate with local authorities prevent unauthorized growth of obstacles and notify the situation to ECAA.

4.2.5. In order to fulfill these obligations, the aerodrome operator **should establish a programme of regular and frequent visual inspections of all areas around the aerodrome** in order to be sure that any construction activity or natural growth (i.e. trees) likely to infringe any of the obstacle limitation surfaces is discovered before it may become a problem.

4.3 Identifying obstacles

4.3.1 Identification of obstacles requires a complete engineering survey of all areas under the aerodrome obstacle limitation surfaces.

4.3.2 The initial survey should produce a chart presenting a plan view of the entire aerodrome and its surroundings. The scope of the chart should be to the outer limit of the conical, approach and take-off climb surfaces. It will need to include profile views of all obstacle limitation surfaces. Each obstacle should be identified in both plan and profile with its description and height above the datum, which should be specified on the chart. Engineering field surveys can be supplemented by aerial photographs and photogrammetry to identify possible obstacles not readily visible from the aerodrome.

4.3.3 The survey specification for the aerodrome obstacle chart Type “A” is contained in Annex 4, Chapter 3, as it is data and information that is required to be provided for promulgation by AIS.

4.3.4 Periodic surveys should be conducted to ensure the validity of the information in the initial survey.

The aerodrome operator should make

a) Frequent visual observations of surrounding areas to determine the presence of new obstacles.
b) Follow-up surveys whenever significant changes occur.
c) A detailed survey of a specific area may be necessary when the initial survey indicates the presence of obstacles for which a control programme is contemplated.

Following completion of an obstacle control programme, the area should be resurveyed to provide corrected data on the presence or absence of obstacles. Similarly, revision surveys should be conducted if changes are made, or planned, to the aerodrome characteristics such as runway length, elevation or orientation. No firm rule can be set down for the frequency of periodic surveys, but constant vigilance is required. Changes in obstacle data arising from surveys are to be notified to the Aeronautical Information Service (AIS) as soon as practicable for promulgation to the aircraft operators.

4.4. **Methods of control**

The viability, and safety, of aerodrome use, by aircraft operators, can be assured by establishing effective obstacle control to maintain the obstacle limitation surfaces. Control can be achieved, in a number of ways, by:

(1) enactment of height zoning protection by the local authority;
(2) establishing an effective obstacle removal programme; or
(3) purchasing of easement or property rights, or all of these.

4.4.1. **Height zoning**

4.4.1.1 The objective of height zoning is to protect the aerodrome obstacle limitation surfaces from intrusion by man-made objects and natural growth such as trees. Height zoning may provide for a minimum allowable height for land use in the vicinity of the aerodrome. Land use zoning is also a means of preventing erection of new obstacles.

4.4.1.2 This is done by the enactment of ordinances identifying height limits underneath the aerodrome obstacle limitation surfaces. The responsibility for the enactment of such an ordinance is a matter between the ECAA, aerodrome operator and the local authority.

4.4.1.3 To give effect to height-zoning a zoning map should be prepared for the guidance of the responsible local authority. The map is a composite, relating all zoning criteria to the ground level around the aerodrome. It should cover the aerodrome design obstacle limitation surfaces and, where applicable, the take-off flight paths for the aerodrome obstacle chart Type “A”.

4.4.1.4 Typical zoning ordinances include a statement of the purpose of, or necessity for, the action. They include a description of the obstacle limitation surfaces which should conform to the aerodrome design surfaces and, if applicable, the aerodrome obstacle chart Type “A”. They also contain a statement of allowable heights which should conform to the specifications for these surfaces. Provisions are made, in the ordinances, for a maximum allowable height, for existing non-conforming uses, for marking and lighting of obstacles and for appeals from the provision of the ordinance. The matter of bird control could also be addressed at the same time by defining areas which the sitting of gravel pits, refuse dumps, sewage outfalls and other features, which attract birds, may be subjected to restriction in the interests of aviation safety.

4.4.2. **Obstacle Removal**

4.4.2.1. When obstacles have been identified, the aerodrome operator should notify to ECAA to make every effort to have them removed, or reduced in height so that they are no longer obstacles. If the obstacle is a single object it may be possible to reach agreement with the owner of the property to reduce the height to acceptable limits without adverse effect.

4.4.2.2. In the case of trees, which are trimmed, agreement should be reached in writing with the property owner to ensure that future growth will not create new obstacles. Property owners can give such assurance by agreeing to trim the trees when necessary, or by permitting access to the premises to have the trimming done by the aerodrome operator's representative.

4.4.2.3. Some aids to navigation both electronic, such as ILS components, and visual, such as approach and runway lights, constitute obstacles which cannot be removed. Such objects should be frangible designed and constructed, and mounted on frangible couplings so that they will fail on impact without significant damage to and aircraft. Where necessary, such objects should be marked and/or lighted.

4.4.3. **Purchase of Easements and Property Rights**

4.4.3.1. In those areas where zoning is inadequate the aerodrome operator may take steps to protect the obstacle limitation surfaces by other means. Examples of other means might be such as gaining easements or property rights. They should include removal or reduction in height of existing obstacles and measures to ensure that no new obstacles are allowed to be erected in future.

4.4.3.2. The aerodrome operator could achieve these objectives either by purchase of easements or property rights. Of these two alternatives, the purchase of easements would often prove to be more simple and economical. In this case, the aerodrome operator secures the consent of the owner (after paying suitable compensation) to lower the height of the obstacle in question.

4.4.3.3. Where agreement can be reached for the reduction in height of an obstacle, the agreement should include a written aviation easement limiting heights over the property to specific levels unless effective height zoning has been established.

4.4.4 **Obstacle shielding**

4.4.4.1. The principle of obstacle shielding is employed to permit a more logical approach to restricting new construction and to prescribing obstacles marking and lighting. Shielding principles are employed when some object, an existing building or natural terrain, already penetrates above one of the aerodrome limitation surfaces. 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.

4.4.4.2. The shielding effect of immovable obstacle 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. 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.

4.5. **Marking and lighting of obstacle**

4.5.1. Where it is impractical to eliminate an obstacle, it should be appropriately marked and/or lighted so as to be clearly visible to pilots in all weather and visibility conditions. The Manual of Aerodrome Standards contains detailed requirements concerning marking and/or lighting of obstacles.

4.5.2. It should be noted that the marking and lighting of obstacles is intended to reduce hazards to aircraft by indicating the presence of the obstacles. It does not necessarily reduce operating limitations which may be imposed by the obstacle. The Manual of Aerodrome Standards specifies that obstacles be marked and, if the aerodrome is used at night, lighted, except that:

a) Such marking and lighting may be omitted when the obstacle is shielded by another obstacle; and

b) The marking may be omitted when the obstacle is lighted by high intensity obstacle lights by day.

4.5.3. Vehicles and other mobile objects, excluding aircraft, on movement areas of aerodromes should be marked and lighted, unless used only on apron areas.

4.5.4. Installation and maintenance of required marking and lighting may be done by the property owner, by community authorities or by the aerodrome operator. The aerodrome operator should make a daily visual inspection of all obstacle lights on and around the aerodrome, and take steps to have inoperative lights repaired. Aerodrome operators may find it helpful to use dual light fixtures with an automatic switch to the second light fixture in case the first one fails. Such an arrangement provides greater assurance of continued obstacle lighting and reduces the number of visits to replace inoperative lamps.

4.6. **Notification of proposed construction**

4.6.1. One of the difficult aspects of obstacle control is the problem of anticipating new construction which may penetrate obstacle limitation surfaces. Aerodrome operator has no direct means of preventing such developments. As noted above, they should conduct frequent inspections of the aerodrome environs to learn of any such projects. Aerodrome operator shall report proposed constructions when they become aware of it and the need to protect the aerodrome indicate the wisdom of bringing such matters to the attention of the Authority. Of course where an obstacle is to be located on aerodrome property, such as electronic or visual aids, the aerodrome operator is responsible for reporting such projects.

4.6.2. Notification of new construction shall be made through aeronautical charts or Aeronautical Information Publication (AIP).

5. Obstacle Surveys

5.1. General

5.1.1. Aerodrome obstacle surveys are conducted in order to enable the aerodrome operators to determine the location and elevation of objects that may constitute infringements of the Aerodrome Manual of Implementing Standards obstacle control surfaces. The surveys include the approach area and surface, take-off climb area and surface, transitional, horizontal and conical surfaces at both proposed and existing aerodromes. In the case of a precision approach runway or a runway on which a precision approach aid is likely to be installed, the survey should cover the additional horizontal surface associated with this aid.

5.1.2. The aerodrome obstacle survey must supply principally:

a) the aerodrome elevation;
b) runway profile elevations;
c) the latitude and longitude of the aerodrome reference point (ARP);
d) the width and length of each runway;
e) the azimuth of each runway;
f) the planimetry at the aerodrome; and
g) the location and elevation of each obstacle in the area covered by the chart.

5.2. Obstacle survey practices

5.2.1. The complexity of each survey and the number of charts maintained will vary from State to State. ICAO Document 9137 gives additional guidance on obstacle survey practices.

5.2.2. The methods for survey include:

a) use of photography during the survey
b) photogrammetric compilation processes and /or
c) field methods

5.2.3. The field survey is considered in a series of steps or processes as follows:

5.2.3.1. **Initial survey**: The initial survey should produce a chart presenting a plan view of the entire aerodrome and its environs to the outer limit of the conical surface (and the outer horizontal surface where established), together with profile views of all obstacle limitation surfaces. Each obstacle should be identified in both plan and profile with its description and height above the datum which should be specified in the chart. More detailed requirements are contained in chapter 3 and 4 of Annex 4, describing aerodrome obstruction chart. Engineering field surveys may be supplemented by aerial photographs and photogrammetry to identify possible obstacles not readily visible from the aerodrome.

5.2.3.2. **Periodic survey:** The aerodrome operator should make frequent visual observations of surrounding areas to determine the presence of new obstacles. Follow up surveys should be conducted whenever significant changes occur. A detailed survey of a specific area may be necessary when the initial survey indicates the presence of obstacles for which a removal programme is contemplated. Following a completion of an obstacle removal programme, the area should be resurveyed to provide corrected data on the presence or absence of obstacles. Similarly, revision surveys should be made if changes are made (or planned) in aerodrome chrematistics such as runway length, elevation or orientation. No firm rule can be set down for the frequency of periodic survey, but constant vigilance is required. Changes in obstacle data arising from such surveys should be reported to the aviation community in accordance with the provisions of Annex 15.

5.2.3.3. **Revision survey** - A thorough field examination of the existing obstacle chart is made and all the field survey data required is supplied to update the chart to conform with the current requirements. The kind and volume of the field work required for revision survey will vary considerably depending upon the age of the chart.

6. Aerodrome equipment and installations which may constitute obstacles

6.1. General

6.1.1. All fixed and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extends above 300ft above ground level are obstacles. Certain aerodrome equipment and installations, because of their air navigation functions, must inevitably be so located and/or constructed that they constitute obstacles. Equipment or installations other than these should not be permitted. This section discusses the sitting and construction of aerodrome equipment and installations which of necessity must be located on a runway strip; a runway end safety area; a taxiway strip; or within the taxiway clearance distance specified in the Aerodromes Manual of Implementing Standards; or on a clearway, if it would endanger an aircraft in the air.

6.1.2. When aerodrome equipment, such as a vehicle or plant is an obstacle, it is generally considered to be temporary obstacle. However, when aerodrome installations such as visual aids, radio aids and meteorological installations are obstacles, they are generally considered to be permanent obstacles.

6.1.3. Any equipment or installation which is situated on an aerodrome and which is an obstacle should be of minimum practicable mass and height and be sited in such a manner as to reduce the hazard to aircraft to a minimum. Additionally, any such equipment or installation which is fixed at its base should incorporate frangible mounting.

6.1.4. The degree to which equipment and installations can be made to conform to the desired construction characteristics is often dependent on the performance requirements of the equipment or installation concerned.

6.1.5. Many factors must be considered in the selection of aid fixtures and their mounting devices to ensure that the reliability of the aids is maintained and that the hazard to aircraft in flight or manoeuvring on the ground is minimal. It is therefore important that the appropriate structural characteristics of all aids which may be obstacles be specified and published. Some guidance material on the frangibility requirements of aerodrome equipment and installations are contained in ICAO Aerodrome Design Manual part 6.

6.2. Types of aerodrome equipment and installations which may constitute obstacles

6.2.1. There are many types of aerodrome equipment and installations which, because of their particular air navigation functions, must be so located that they constitute obstacles. Such aerodrome equipment and installations include:

a) ILS glide path antennas;
b) ILS inner marker beacons;
c) ILS localizer antennas;
d) Wind direction indicators;
e) Landing direction indicators;
f) Anemometers;
g) Ceilometers;
h) Transmissometer;
i) Elevated runway edge, threshold, end and stopway lights;
j) Elevated taxiway edge lights;
k) Approach lights;
l) Visual approach slope indicator systems/precision approach slope indicator systems;
m) Signs and markers;
n) Components of the microwave landing system (MLS);
o) Certain radar and other electronic installations and other devices;
p) VOR or VOR/DME when located on aerodrome;
q) Precision approach radar system or elements;
r) VHF direction finders; and
s) Aerodrome maintenance equipment, e.g. tracks, tractors.

There is wide variation in the structural characteristics of these aids currently in use. Some guidance is provided below on appropriate structural characteristics of these aids for guidance of designers.

6.2.2. **ILS Glide Path Antennas**

6.2.2.1. The ILS glide path antenna masts may consist of thin walled large-diameter tubes which are slightly cone-shaped and made from fiber-glass material with short glass fibers. These masts can resist considerable wind loadings but they will break with the application of a load such as would be imposed in the event of impact by an aircraft.

6.2.3. **ILS Localizer antennas**

6.2.3.1. ILS localizer antenna supports may consist of thin-walled tubes made from fiber glass material with short glass fibers. The maximum height of the installation may be about 3 m. The reflectors of the localizer antennas may be rods approximately 2.5m long, held by springs only. When exposed to loads in excess of the design load, they jump out of their supports and thus minimize the hazard to an aircraft overrunning the runway. Alternatively, the localizer antenna could comprise aluminum-clad balsa wood spars supported by aluminum tubing where the supporting structure incorporates shear pins at critical points to allow the structure to collapse under impact.

6.2.4. **Transmissometer**

6.2.4.1. The structure on which the transmissometer is placed may be constructed of hollow aluminum tubes that, although sufficiently strong by themselves, bend or break easily should an aircraft collide with them. The structure is attached to sunken concrete foundation by means of breakable bolts.

6.2.5. **Elevated runway edge, threshold, end, stopway and taxiway edge lighting**

6.2.5.1. The height of these lights should be sufficiently low to ensure propeller and engine pod clearance. Wing flexes and strut compression under dynamic loads can bring the engine pods of some aircraft to near ground level. Only a small height can be tolerated, and a maximum height of 36 cm is advocated.

6.2.5.2. These aids should be mounted on frangible mounting devices. The impact load required to cause failure at the break point should not exceed 5kg and a static load required to cause failure should not exceed 230 kg applied horizontally 30 cm above the break point of the mounting device. The desirable maximum height of light units and frangible coupling is 36 cm above ground. Units exceeding this height limitation may require higher breaking characteristics for the frangible mounting device, but the frangibility should be such that, should a unit be hit by an aircraft, the impact would result in minimum damage to aircraft.

6.2.5.3. In addition, all elevated light installed on runways of code letters A and B should be capable of withstanding a jet engine exhaust velocity of 300 kt, and lights on runways of code letters C, D, and E, a lower velocity of 200kt. Elevated taxiway edge lights should be able to withstand an exhaust velocity of 200 kt.

6.2.6. **Approach lighting system**

6.2.6.1. To minimize the hazard to aircraft that may strike them, approach lights should have a frangible device, or their supports be of a frangible design.

6.2.6.2. Where the terrain requires light fittings and their supporting structure to be taller than approximately 1.8 m and they constitute the critical hazard, it is considered that it is not practicable to require that the frangible mounting devise be at the base of the structure. The frangible portion may be limited to the top 1.8 m of the structure, except if the structure itself is frangible. Though there is some question of the need to provide frangibility for approach lights installed beyond 300 m before the threshold (as these light are required to be below the approach surface), it is recognized that protection needs to be provided for aircraft that might descend below the approach or take-off surfaces. A frangible top portion of 1.8 m is considered to be a minimum specification, and a longer frangible top portion should be provided where possible.

6.2.6.3. In all cases the unit and supports of the approach lighting system should fail when an impact load of not more than 5kg and a static load of not less than 230 kg are applied horizontally at 30 cm above the break point of the structure.

6.2.6.4. Where it is necessary for approach lights to be installed in stopways, the light should be inset in the surface when the stopway is paved. When the stopway is not paved, they should either be inset or, if elevated, meet the criteria for frangibility agreed for lights installed beyond the runway end.

6.2.7. **Other aids (e.g. PAPI, signs and markers)**

6.2.7.1. These aids should be located as far as practicable from the edges of runways, taxiways and aprons as is compatible with their function. Every effort should be made to ensure that the aids will retain their structural integrity when subjected to the most severe environmental conditions. However, when subjected to aircraft impact in excess of the foregoing conditions, the aids will break or distort in a manner which will cause minimum or no damage to aircraft.

6.2.7.2. Caution should be taken when installing visual aids in the movement area to ensure that the light support base does not protrude above ground, but rather terminates below ground as required by environmental conditions so as to cause minimum or no damage to the aircraft overrunning them. However, the frangible coupling should always be above ground level.

7. OBSTACLE CONTROL PROCEDURES IN THE AERODROME MANUAL

7.1. Details of the procedures for inspection of the aerodrome movement area, obstacle limitation surface and for obstacle control at an aerodrome should be presented in the Aerodrome Manual.

7.2. Particulars in the aerodrome manual of the procedures for the inspection of the aerodrome movement area and obstacle limitation surface must include details of the following:

a) Arrangements for carrying out inspections, including runway friction and water depth measurement on runways and taxiways during and outside normal hours of aerodrome operations;

b) Arrangements and means of communicating with ATC during an inspection;

c) Arrangements for keeping an inspection logbook and the location of the logbook;

d) Details of inspection intervals and times;

e) Inspection checklist;

f) Arrangements for reporting the results of inspections and for taking prompt follow-up actions to ensure correction of unsafe conditions; and

g) The names and roles of persons responsible for carrying out inspections and their contact numbers during and after working hours.

7.3. Particulars in the aerodrome manual for obstacle control must contain details setting out the procedures for –

a) Monitoring the obstacle limitation surfaces and Type A chart for obstacle in the take-off surface;

b) Controlling obstacles within the authority of the aerodrome operator;

c) Monitoring the height of buildings or structures within the boundaries of the obstacle limitation surfaces;

d) Controlling new developments in the vicinity of the aerodrome;

e) Notifying the Authority of the nature and location of obstacles and any subsequent addition or removal of obstacles for action as necessary, including amendment of AIS publications.