

AGA – AERODROMES

1.0 GENERAL INFORMATION

1.1 GENERAL

All flights into, from or over the territory of Canada and landings in such territory shall be carried out in accordance with the regulations of Canada regarding civil aviation. Aircraft landing in or departing from the territory of Canada must first land at an aerodrome at which Customs control facilities have been provided. (See CFS for complete list.)

The privileges extended are subject to each flight having been properly authorized and to whatever restrictions the Government of Canada may, from time to time, or in specific cases, deem to be warranted.

1.1.1 Aerodrome Authority

Transport Canada is responsible for the surveillance of all certified civil aerodromes in Canada. The addresses can be found in GEN 1.1.2.

1.1.2 ICAO Documents

International Standards and Recommended Practices, Aerodromes, ANNEX 14, Volumes I and II.

1.1.3 Differences with ICAO Standards, Recommended Practices and Procedures

Differences between Canadian regulations and practices and ICAO standards, recommended practices and procedures will be published at a future date.

1.1.4 Canadian Runway Friction Index

Many airports throughout Canada are equipped with mechanical and electronic decelerometers which are used to obtain an average of the runway friction measurement. The average decelerometer reading of each runway is reported as the Canadian Runway Friction Index (CRFI). Experience has shown that results obtained from the various types of decelerometers on water and slush are not accurate, and the CRFI will not be available when these conditions are present.

Aerodromes equipped with runway friction decelerometer capability are listed in CFS under “Runway Data”.

Operational data relating to the reported average CRFI and the methods to be used when applying the factors to aircraft performance are presented in AIR 1.6.

1.1.5 Contaminated Runway Operations

Canadian Civil Aerodromes

At Canadian Aerodromes where snow removal and ice control operations are conducted, assessment and mitigation procedures, are carried out to the extent that is practicable in order to provide movement surfaces that will permit safe operational use.

Pilots who are confronted with conditions produced by the changing Canadian climate must be familiar with and anticipate the overall effect of contaminated runways on aircraft handling characteristics in order to take any corrective actions considered necessary for flight safety.

In general terms, whenever a contaminant such as water, snow or ice is introduced onto the runway surface, the effective coefficient of friction between the aircraft tire and runway is reduced. However, the accelerate/stop distance, landing distance and crosswind limitations contained in aircraft flight manuals are demonstrated in accordance with specified performance criteria on bare and dry runways during the aircraft certification flight test program, and are thus valid only when the runway is bare and dry.

As a result, the stop portion of the accelerate/stop distance will increase, the landing distance will increase and a crosswind will present directional control difficulties.

It is therefore expected that pilots will take all necessary action, including the application of any appropriate adjustment factor to calculate stopping distances for their aircraft as may be required based on the Runway Surface Condition and CRFI information.

Department of National Defence Aerodromes

Snow removal and ice control policy and procedures at Canadian military aerodromes are similar to those of Canadian Civil Aerodromes; however, the military aerodrome operator may not use the same type of decelerometer to obtain the average runway friction index.

1.1.6 Bird Hazard

Most major airports in Canada have a plan to identify and control the hazards birds present to flight operations. This situation generally is a problem during the spring and autumn migrations; however, some airports are continuously subjected to bird hazard. Pilots should monitor ATIS during the migratory season for information concerning this hazard.

For more information on bird hazard, migratory birds and bird strike reporting, see RAC 1.15.

1.2 INTERNATIONAL AIRPORTS

Some airports are designated “International Airport” by Transport Canada to support international commercial air transport and are listed as such in the *ICAO Air Navigation Plan - North Atlantic, North American, and Pacific Regions* (ICAO Doc 8755/13). (See FAL 2.2.2 for information on International Commercial Flights.)

1.2.1 ICAO Definitions

International Scheduled Air Transport, Regular Use (RS): An aerodrome which may be listed in the flight plan as an aerodrome of intended landing.

International Scheduled Air Transport, Alternate Use (AS): An aerodrome specified in the flight plan to which a flight may proceed when it becomes inadvisable to land at the aerodrome of intended landing.

International General Aviation, Regular Use (RG): All aircraft other than those operated on an international air service.

NOTE: Any of the listed regular aerodromes may be used as a regular or alternate aerodrome.

1.3 AERODROME DIRECTORY

Complete general data on aerodromes is listed in CFS. ICAO Type A Charts are available from Aeronautical Information Service (see MAP 3.6).

1.4 AERONAUTICAL GROUND LIGHTS

Aeronautical ground lights are found in CFS under the aerodrome they serve or on VFR navigational charts.

2.0 AERODROMES AND AIRPORTS

2.1 GENERAL

An aerodrome is defined by the Aeronautics Act as:

Any area of land, water (including the frozen surface thereof) or other supporting surface used, designed, prepared, equipped or set apart for use either in whole or in part for the arrival, departure, movement or servicing of aircraft and includes any buildings, installations and equipment situated thereon or associated therewith.

This has a very broad application for Canada where there are no general restrictions preventing landings or takeoffs. There are defined exceptions, but, for the most part, all of Canada can be an aerodrome.

Rules for operating an aerodrome are provided in Part III of the *Canadian Aviation Regulations* (CARs) under Subsection 301. The focus is to define the minimum safety standards that must be offered as well as making provision for inspection by the Minister. The operators of aerodromes are encouraged, in the interest of aviation safety, efficiency and convenience to improve their aerodromes beyond the basic regulatory requirements using, as guidelines, the standards and recommended practices applicable for the certification of aerodromes as airports. The users of aerodromes are, however, reminded that the improvement of aerodrome physical characteristics, visual aids, lighting and markings beyond the basic regulatory requirements for aerodromes is a matter of individual aerodrome operator initiative. Such improvements do not require regulatory compliance, nor are those improvements inspected or certified in accordance with the standards and recommended practices applicable for the certification of aerodromes as airports.

Subsection 301 also puts into regulation the “Registration” process, which is used to publish and maintain information on an aerodrome in the *Canada Flight Supplement* (CFS) or the *Canada Water Aerodrome Supplement* (CWAS). This specifies that an aerodrome operator can expect:

- (a) their aerodrome will be registered in the appropriate publication when the operator provides the necessary information respecting location, markings, lighting, use and operation of the aerodrome;
- (b) their aerodrome will not be registered in the appropriate publication if the operator of the aerodrome does not meet the aerodrome regulatory requirements for markers and markings, warning notices, wind direction indicator and lighting;
- (c) to assume responsibility to immediately notify the Minister of any changes in the aerodrome’s published information regarding location, markings, lighting, use or operation of the aerodrome; and
- (d) their aerodrome will be classed as a registered aerodrome when it is published in the CFS or CWAS.

NOTE: No aerodrome operator is obliged by these regulations to have information published in the CFS or CWAS and the Minister may choose not to publish information for a site that is considered to be hazardous to aviation safety.

In addition to the initial application inspection, registered aerodromes are inspected on a required basis to verify compliance with CARs and the accuracy of information published in the CFS and CWAS. Such information, however, is only published for the convenience of the pilot and should be confirmed through contact with the aerodrome operator before using a site.

Besides the “Aerodrome” and “Registered Aerodrome” terminology, there is also the term “Airport.” This is an aerodrome for which a certificate has been issued under Subsection 302 of CARs. The objective is to protect those that do not have the knowledge or ability to protect themselves—the fare paying public and the resident in the vicinity of an airport that could be affected by unsafe operations. This is done by ensuring the site is inspected periodically for compliance with Transport Canada Standards for obstruction surfaces, physical characteristics, marking and lighting, which have been recorded in an Airport Operations Manual, and Airside Operating Procedures. The current status is to be advertised to all interested aircraft operators through the CFS, *Canada Air Pilot* (CAP), NOTAM and voice advisory as applicable.

2.2 USE OF AERODROMES AND AIRPORTS

Public Use: An aerodrome or airport listed in the CFS or CWAS that does not require prior permission of the aerodrome or airport operator for aircraft operations is called a public-use aerodrome or airport.

Private Use: An aerodrome or airport can be listed in the CFS or CWAS, but be limited in its use. This can include:

- (a) **Prior Permission Required (PPR):** The aerodrome operator’s permission is required prior to use. All military aerodromes require PPR for Civilian aircraft.
- (b) **Prior Notice Required (PNR):** The aerodrome operator owner or operator is to be notified prior to use in order that current information on the aerodrome may be provided.

NOTES

- 1: Pilots and aerodrome operators are reminded that aerodrome or airport trespass restrictions are not applicable to aircraft in distress.
- 2: Pilots intending to use a non-certified aerodrome are advised to obtain current information from the aerodrome operator concerning operating conditions prior to using that aerodrome for aircraft operations.

2.3 AIRPORT CERTIFICATION

2.3.1 General

Transport Canada has the responsibility for the development and operation of a safe national air transportation system. Therefore, airports supporting passenger-carrying commercial operations must meet accepted safety standards. An airport certificate testifies that an aerodrome meets such safety standards. Where exemptions from airport certification safety standards are required, studies will be undertaken to devise offsetting procedures, which will provide equivalent levels of safety.

2.3.2 Applicability of Airport Certification

The requirement for airport certification applies to:

- (a) any aerodrome that is located within the built-up area of a city or town;
- (b) any land aerodrome that is used by an air operator for the purpose of a scheduled service for the transport of passengers; and
- (c) any other aerodrome, where the Minister is of the opinion that it is in the public interest for that aerodrome to meet the requirements necessary for the issuance of an airport certificate.

Exempt are:

- (a) military aerodromes; and
- (b) aerodromes for which the Minister has written an exemption, and an equivalent level of safety is defined.

2.3.3 Transport Canada Responsibilities

The responsibilities of Transport Canada include:

- (a) developing safety standards, policies and criteria for:
 - (i) airfield physical characteristics, including runway and taxiway dimensions, and separations,
 - (ii) marking and lighting of manoeuvring surfaces and obstacles, and
 - (iii) obstacle limitation surfaces in the vicinity of airports;
- (b) providing assistance to airport operators in drafting Airport Operations Manuals (AOM);
- (c) conducting aeronautical studies where exemptions from airport certification safety standards are required;
- (d) certifying airports and inspect against the requirements and conditions of the AOM; and
- (e) verifying, amending and relaying pertinent airport information to be identified in the appropriate aeronautical information services (AIS) publications.

2.3.4 Operator Responsibilities

The aerodrome or airport operator’s responsibilities include:

- (a) completing and distributing an approved AOM;
- (b) maintaining an airport in accordance with the requirements specified in the AOM;

- (c) detailing the airport general operating procedures, including the following:
 - (i) hours of operation,
 - (ii) apron management and apron safety plans,
 - (iii) airside access and traffic control procedures,
 - (iv) snow and ice removal and grass cutting services,
 - (v) airport emergency services, such as Emergency Response Service (ERS) and medical services,
 - (vi) bird and animal hazard procedures,
 - (vii) airport safety programs, including Foreign Object Damage control,
 - (viii) airport security programs,
 - (ix) the issuance of NOTAM; and
- (d) advising Transport Canada and aircraft operators whenever services or facilities fall below requirements prescribed in the AOM.

2.3.5 Airport Certification Process

Airport certification is a process whereby Transport Canada certifies that an aerodrome meets airport certification safety standards and that aerodrome data, as provided by the owner or operator and confirmed by Transport Canada inspectors, is correct and published in the appropriate aeronautical information publications. When these requirements are met, an airport certificate is issued. The airport certificate documentation includes:

- (a) the airport certificate, which certifies that the airport meets required standards; and
- (b) the AOM, which details the airport specifications, facilities and services, and specifies the responsibilities of the operator for the maintenance of airport certification standards. The AOM is a reference for airport operations and inspections, which ensures that deviations from airport certification safety standards and the resulting conditions of airport certification are approved.

2.3.6 Regulatory References for Airport and Heliport Certification

The regulatory authority for airport certification is Subpart 302 of the CARs. The regulatory authority for heliport certification is Subpart 305 of the CARs. Standards for airport certification and the associated process are contained in the *Aerodrome Standards and Recommended Practices* (TP 312E), while standards for heliport certification and the associated process are contained in CARs Standard 325—*Heliports and the Heliport and Helideck Standards and Recommended Practices* (TP 2586E). Depending on the date on which the heliport certificate was issued, heliport operators will have to comply with either CARs Standard 325 or TP 2586E.

2.4 AIRPORT CERTIFICATE

2.4.1 Issue

An airport certificate will be issued when an inspection confirms that all requirements for airport certification have been met, including the following:

- (a) where an exemption from airport certification safety standards exists, measures have been implemented to provide for an equivalent level of safety; and
- (b) the AOM has been approved by the Regional Director, Civil Aviation.

2.4.2 Airport Certificate Validity and Amendments

The airport certificate is a legal aviation document that remains valid as long as the airport is operated in accordance with the AOM. Periodic inspections are conducted to verify continued conformity to airport certification safety standards and conditions specified in the AOM.

Transport Canada may make amendments to the conditions of issue of an airport certificate where:

- (a) an approved deviation from airport certification safety standards and a change in the conditions of airport certification are required;
- (b) there is a change in the use or operations of the airport;
- (c) there is a change in the boundaries of the airport; and
- (d) it is requested by the holder of the airport certificate.

3.0 RUNWAY CHARACTERISTICS

3.1 RUNWAY LENGTH AND WIDTH

Runways are generally dimensioned to accommodate the aircraft considered to be the “critical aircraft” that is anticipated to utilize the runways most frequently. The “critical aircraft” is defined as being the aircraft type which the airport is intended to serve and which requires the greatest runway length. To identify the “critical aircraft”, flight manual performance data of a variety of aircraft are examined. Once the “critical aircraft” has been determined, the longest distance determined from analyzing both take-off and landing performance is used as the basis for runway dimensions. Generally, the runway width is increased to a maximum of 60 m as a function of length.

3.2 GRADED AREA

Each runway is bounded on the sides and ends by a prepared “graded” area. This graded area is provided to prevent catastrophic damage to aircraft leaving the runway sides and to protect aircraft that overfly the runway at very low altitudes during a balked approach for landing. The graded area at the end of the runway is not considered a normal stopway for accelerate-to-stop calculations.

3.3 DISPLACED RUNWAY THRESHOLD

Occasionally, natural and human-made obstacles penetrate the obstacle limitation surfaces of the take-off and approach paths to runways.

To ensure that a safe clearance from these obstacles is maintained, it is necessary to displace the runway thresholds. In the case of runways for which instrument approach procedures are published in the CAP, the usable runway distances for landings and takeoffs are specified as declared distances. The displacements are also depicted on the aerodrome or airport diagram in both the CAP and the CFS. For other runways not having published CAP approaches, the requisite data is given in the CFS. Where a threshold is displaced, it is marked as shown in AGA 5.4.1.

When the portion of the runway before the displaced threshold is marked with displaced threshold arrows (see AGA 5.4.1), it is permissible to use that portion of the runway for taxiing, for takeoff and for the landing roll-out from the opposite direction. In addition, this displaced portion of the runway may be used for landing; however, it is the pilot’s responsibility to ensure that the descent path can be safely adjusted to clear all obstacles. When taking off from the end opposite to the displaced threshold, pilots should recognize the fact that there are obstacles present that penetrated above the approach slope to the physical end of the runway, which resulted in the threshold being displaced.

When a section of a runway is closed, either temporarily because of construction or permanently because the full length is no longer required, the closed portion of the runway is unavailable for the surface movement of aircraft for taxiing, take-off or landing purposes and is marked with an “X”, indicating that the area is not suitable for aircraft use. A lighted “X” may also be used to mark a temporarily closed runway.

The closed portion of the runway may be shown on the aerodrome or airport diagram in the CFS and the CAP for identification purposes; however, declared distances will only include runway length starting at the new threshold position.



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3.4 TURNAROUND BAY

Some runways have thresholds not served directly by taxiways. In such cases, there may be a widened area which can be used to facilitate turnaround. Pilots are cautioned that these bays do not give sufficient clearance from the runway edge to allow their use for holding while other aircraft use the runway.

3.5 PRE-THRESHOLD AREA

A paved, non load-bearing surface that precedes a runway threshold is marked over the entire length with yellow chevrons, as shown in AGA 5.4.2, when its length exceeds 60 m.

3.6 STOPWAY

A stopway is a rectangular area on the ground at the end of the runway, in the direction of takeoff, prepared as a suitable area in which an aeroplane can be stopped in the case of an abandoned takeoff. It is marked over the entire length with yellow chevrons as shown in AGA 5.4.2 (when its length exceeds 60 m) and is lighted with red edge and end lights in the take-off direction. Its length is included in the ASDA declared for the runway.

3.7 CLEARWAY

A clearway is a rectangular area above the ground or water selected as a suitable area over which an aeroplane may make a portion of its initial climb.

3.8 DECLARED DISTANCES

The CAP provides declared distance information which is defined as follows:

(a) *Take-off Run Available (TORA)*: The length of runway declared available and suitable for the ground run of an aeroplane taking off.

(b) *Takeoff Distance Available (TODA)*: The length of the takeoff run available plus the length of the clearway, if provided.

NOTE: Maximum clearway length allowed is 300 m. The clearway length allowed must lie within the aerodrome or airport boundary.

(c) *Accelerate Stop Distance Available (ASDA)*: The length of the takeoff run available plus the length of the stopway, if provided.

(d) *Landing Distance Available (LDA)*: The length of runway which is declared available and suitable for the ground run of an aeroplane landing.

3.9 RAPID-EXIT TAXIWAYS

To reduce the aircraft runway occupancy time, some aerodromes or airports provide rapid-exit taxiways which are angled at approximately 30 degrees to the runway.

3.10 RUNWAY AND TAXIWAY BEARING STRENGTH

The bearing strength of some aerodrome or airport pavement surfaces (runways, taxiways and aprons) to withstand continuous use by aircraft of specific weights and tire pressures has been assessed at specific locations. The TC Pavement Load Rating (PLR) and ICAO Pavement Classification Number (PCN) define the weight limits at or below which the aircraft may operate on pavements without prior approval of the aerodrome or airport authority. The tire pressure and Aircraft Load Rating (ALR)/Aircraft Classification Number (ACN) must be equal to or less than the PLR/PCN figures published for each aerodrome or airport. Aircraft exceeding published load restrictions may be permitted limited operations following an engineering evaluation by the airport operator. Requests to permit such operations should be forwarded to the airport operator and include the type of aircraft, operating weight and tire pressure, frequency of proposed operation and pavement areas required at the aerodrome or airport.

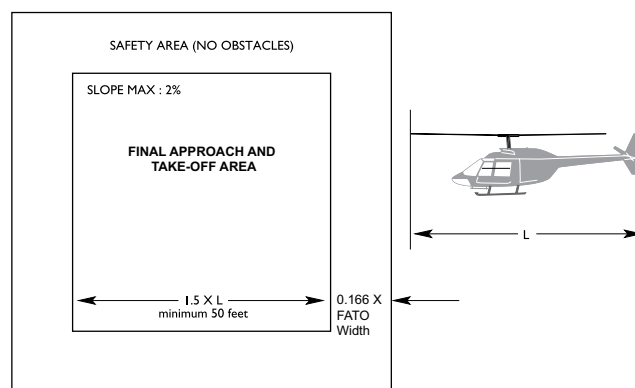
3.10.1 Pavement Load Rating Charts

Operators requiring information respecting aircraft weight limitations in effect at an aerodrome or airport can contact the airport operator.

3.11 HELIPORTS

Because of the unique operational characteristics of helicopters, heliport physical characteristics are significantly different from the physical characteristics of aerodromes. For instance, there is no requirement for a runway at a heliport. In addition, the heliport FATO size is 1.5 times larger than the longest helicopter for which the heliport is certified. A safety area surrounds the FATO, which is to be kept free of obstacles other than visual aids.

FINAL APPROACH AND TAKE-OFF AREA / SAFETY AREA



3.11.1 FATO

Obstacle-free arrival and departure paths to and from a FATO are always required. In some cases, a FATO can be offset from the intended landing area. In this case, helicopter parking positions are established on an apron area and pilots will hover taxi to transition between the FATO and the parking position.

3.11.2 Heliport Classification

Non-instrument heliports have three classifications: H1, H2 and H3. H1 heliports have no available emergency landing areas within 625 m from the FATO and are restricted for use by multi-engined helicopters capable of remaining 4.5 m above all obstacles within the defined approach/departure pathways when operating with one engine inoperative and in accordance with their aircraft flight manual (AFM).

H2 heliports have available emergency landing areas within 625 m from the FATO; however, due to high obstacles within the approach/departure pathways, the associated approach slopes are higher, requiring the use of multi-engined helicopters. H3 heliports have available emergency landing areas within 625 m from the FATO and no obstacles that penetrate the obstacle limitation surfaces, and as such, may be used by single- or multi-engined helicopters. Heliport classifications are specified in the CFS.

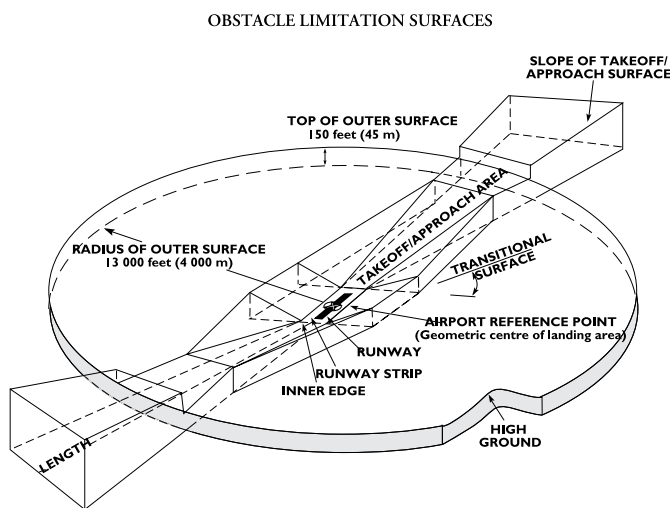
3.11.3 Heliport Operational Limitations

All heliports have three operational limitations. The limitations for each specific heliport are listed in the CFS.

The *load bearing strength* shall be identified for each elevated or rooftop FATO or floating supporting structure. Surface-level heliports need not list a load bearing strength.

The *maximum helicopter overall length* shall be identified for each FATO. This is calculated as the width or diameter of each FATO, divided by 1.5. This number represents the largest size helicopter for which the FATO is certified.

The *heliport category* (instrument or non-instrument) and *classification*, as detailed in AGA 3.11.2, above, shall also be listed.



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4.0 OBSTACLE RESTRICTIONS

4.1 GENERAL

The safe and efficient use of an aerodrome, airport or heliport can be seriously eroded by the presence of obstacles within or close to the take-off or approach areas. The airspace in the vicinity of takeoff or approach areas (to be maintained free from obstacles so as to facilitate the safe operation of aircraft) is defined for the purpose of either:

- (a) regulating aircraft operations where obstacles exist;
- (b) removing obstacles; or
- (c) preventing the creation of obstacles.

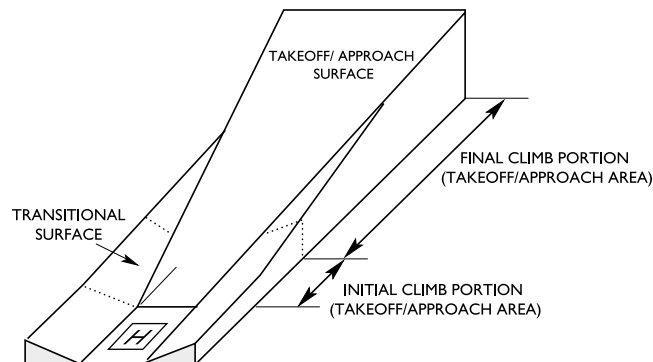
4.2 OBSTACLE LIMITATION SURFACES

4.2.1 General

An obstacle limitation surface establishes the limit to which objects may project into the airspace associated with an aerodrome and still ensure that aircraft operations at the aerodrome will be conducted safely. It includes a take-off/ approach surface, a transitional surface and an outer surface.

4.2.2 Heliports

Heliports are normally served by two approach and departure paths. In some instances, only one approach and departure path may be established and will have the additional requirement for a transition surface.



4.3 AIRPORT ZONING REGULATIONS

4.3.1 General

An Airport Zoning Regulation is a regulation respecting a given airport pursuant to section 5.4(1) of the *Aeronautics Act* for the purposes of:

- (a) preventing lands adjacent to or in the vicinity of a TC airport or airport site from being used or developed in a manner that is, in the opinion of the Minister, incompatible with the operation of an airport;
- (b) preventing lands adjacent to or in the vicinity of an airport or airport site from being used or developed in a manner that is, in the opinion of the Minister, incompatible with the safe operation of an airport or aircraft; and

- (c) preventing lands adjacent to or in the vicinity of facilities used to provide services relating to aeronautics from being used or developed in a manner that would, in the opinion of the Minister, cause interference with signals or communications to and from aircraft or to and from those facilities.

NOTE: An Airport Zoning Regulation applies only to land *outside* the boundary of the airport protected by the *Airport Zoning Regulation*. Obstacles *within* an airport boundary must not penetrate an obstacle limitation surface for the runway(s) involved unless the obstacle is exempted as the result of an aeronautical study.

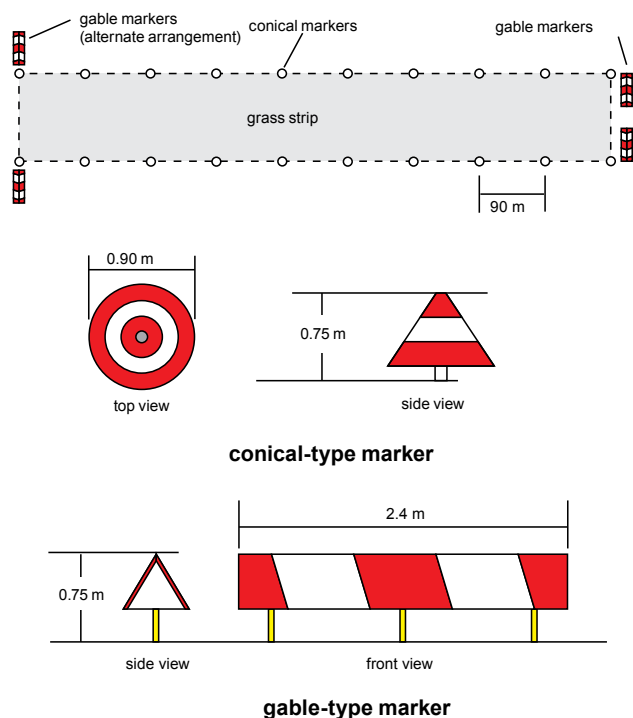
4.3.2 Airports Where Zoning Regulations Are in Effect

A list of airports where Airport Zoning Regulations are in effect is maintained in the Regional Aerodrome Safety office.

5.0 MARKERS, MARKING, SIGNS AND INDICATORS

5.1 AIRCRAFT TAKEOFF OR LANDING AREA BOUNDARY MARKERS

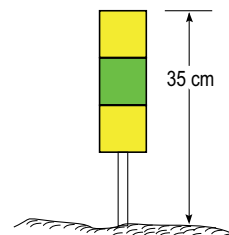
The take-off or landing area boundaries of aerodromes without prepared runways are indicated by conical- or gable-type markers (highway-type cone markers are acceptable) or by evergreen trees in winter. No boundary markers are required if the entire movement area is safe for aircraft operations. The markers are typically coloured international orange and white or solid international orange.



Examples of conical and gable markers

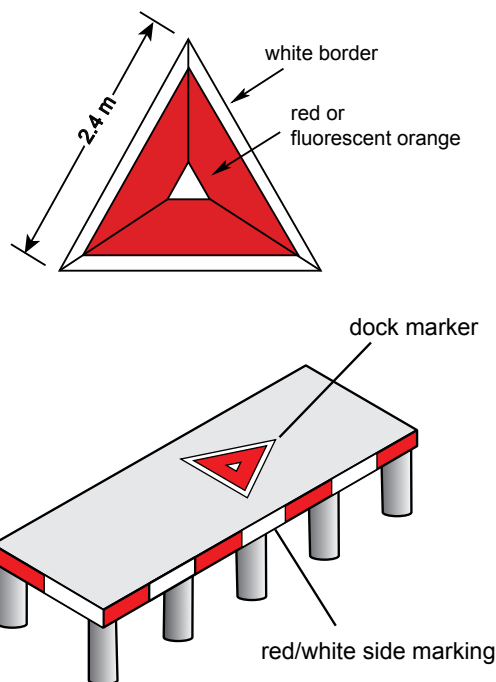
5.2 AIR TAXIWAY EDGE MARKERS

The edges of the air taxiway route are indicated by markers 35 cm in height, and consist of three equal horizontal bands arranged vertically. The top and bottom bands are yellow and the middle one is green.



5.3 SEAPLANE DOCK MARKERS

Seaplane docks are marked to facilitate their identification. The dock is marked with an equilateral triangle measuring 2.4 m on each side. The dock to which this marker is affixed also has red/white side marking.



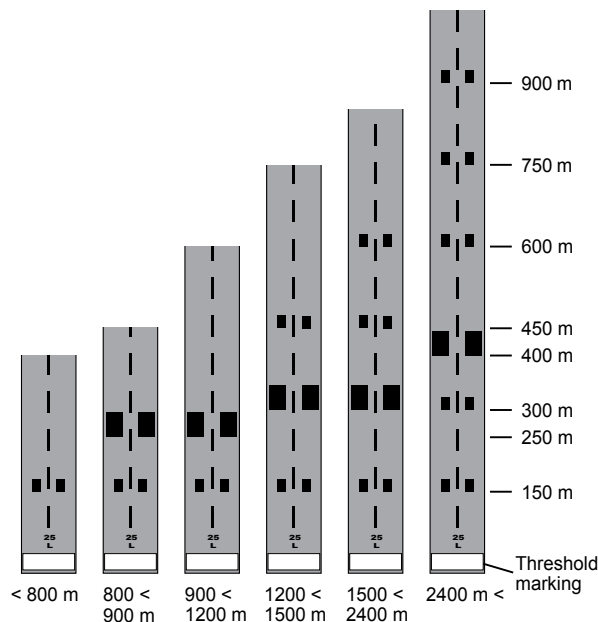
5.4 RUNWAY MARKINGS

Aeroplane runway markings vary depending on runway length and width, and are described in detail in Transport Canada publication, *Aerodrome Standards and Recommended Practices* (TP 312E). The colour of the markings is white. The number of pairs of touchdown zone markings depends on the LDA, as shown in the table below. Where operationally necessary, an additional pair of touchdown zone marking stripes may be provided on a Code 2 runway, 150 m beyond the beginning of the aiming point marking.

Landing Distance Available (LDA)	Pair(s) of stripes
less than 900 m	1
900 m up to but not including 1 200 m	2
1 200 m up to but not including 1 500 m	3
1 500 m up to but not including 2 400 m	4
2 400 m or more	6

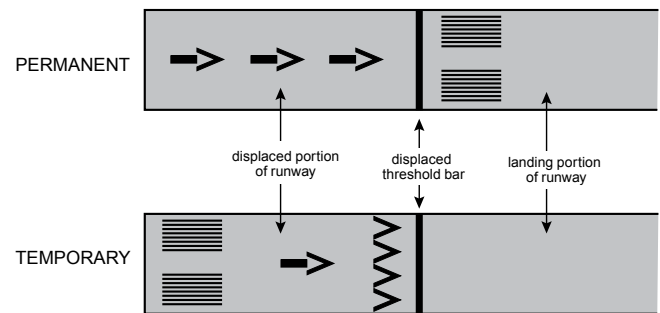
The aiming point marking is provided at a distance from the threshold according to the table below. With application of aiming point marking, pairs of touchdown zone markings are omitted if intended for the same location or if they are to be placed within 50 m of an aiming point marking.

Landing Distance Available (LDA)	Distance, threshold to start of marking
less than 800 m	150 m
800 m up to but not including 1 200 m	250 m
1 200 m up to but not including 2 400 m	300 m
2 400 m or more	400 m



Examples of Runway Marking

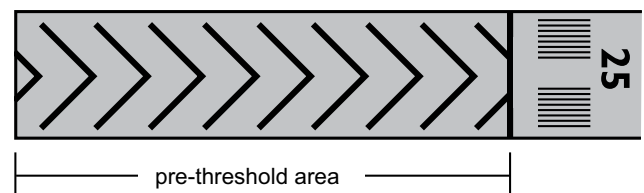
5.4.1 Displaced Threshold Markings



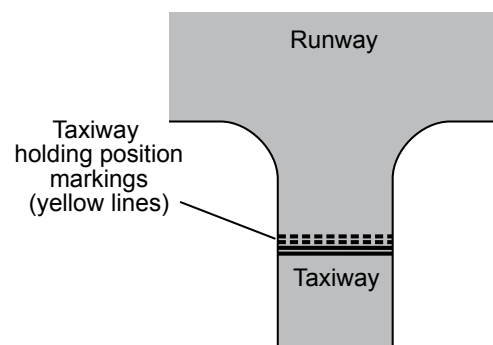
NOTE: When the threshold must be displaced for a relatively short period of time, painting a temporary threshold bar would be impractical. Flags, cones, or wing bar lights would be installed to indicate the position of the displaced threshold. A NOTAM or voice advisory warning of the temporary displacement will contain a description of the markers and the expected duration of the displacement in addition to the length of the closed portion and the remaining usable runway.

5.4.2 Stopways

The paved area preceding a runway threshold prepared, maintained and declared as a stopway is marked with yellow chevrons when its length exceeds 60 m. This area is not available for taxiing, the initial take-off roll or the landing rollout. The chevron markings may also be used on blast pads.



5.4.3 Taxiway Exit and Holding Markings



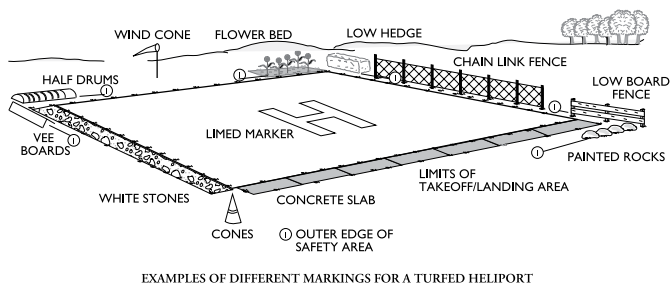
5.5 HELIPORTS

5.5.1 Heliport TLOF Marking

When the perimeter of the TLOF is not otherwise obvious, it will be marked by a continuous white line.

5.5.2 Safety Area Markers

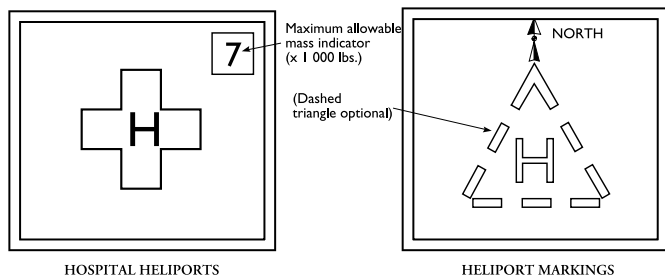
The safety area that surrounds the FATO may be indicated by pyramidal, conical or other types of suitable markers or markings.



5.5.3 Heliport Identification Markings

Heliports are identified by a white capital letter “H” centred within the TLOF. Where it is necessary to enhance the visibility of the letter “H”, it may be centred within a dashed triangle. Hospital heliports are identified by a red capital letter “H” centred within a white cross.

The letter “H” will be oriented with magnetic north, except in the area of compass unreliability, where it will be true north.

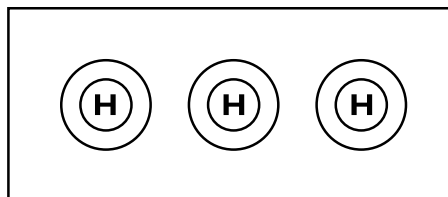


5.5.4 FATO Marking

Where practicable, the boundary of the FATO will be indicated by pyramidal, conical or other types of suitable markers. The markers shall be frangible and shall not exceed a height of 25 m. An aiming point marking will be provided and located in the centre of the FATO, where practicable. Where the direction of the helicopter parking position is not obvious, an indicator will show its direction.

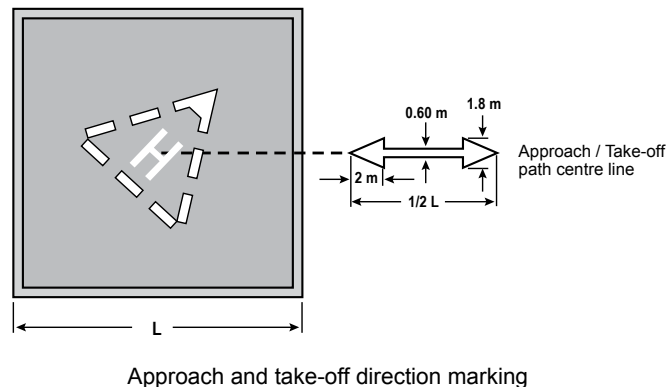
5.5.5 Helicopter Parking Position Marking

Helicopter parking position markings consist of two concentric yellow circles. The diameter of the outer circle shall not be less than 1.2 times the overall length of the longest helicopter for which the helicopter parking position is certified. The diameter of the inner circle is one-third of the size of the outer circle. An “H” marking will be centred within the inner circle.



5.5.6 Approach and Take-Off Direction Indicator Markings

There may be heliports where, due to nearby obstacles or noise-sensitive areas, approach and take-off directions are designated. The direction of the approach and take-off paths is indicated by a double-headed arrow, showing their inbound and outbound directions. They are located beyond the edge of the safety area or on the aiming point marking.

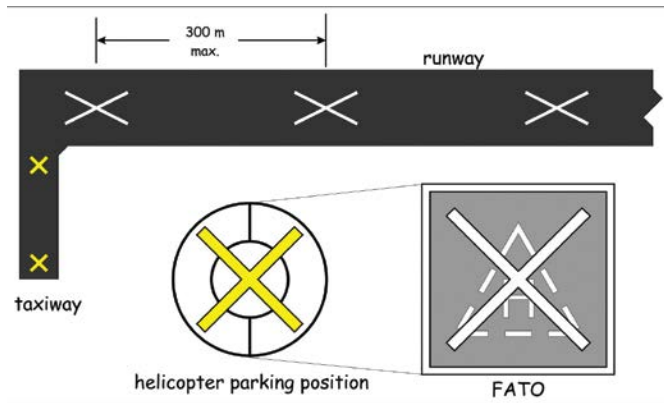


5.6 CLOSED MARKINGS

Runways, taxiways, helicopter FATOs and other helicopter areas that are closed to operations are marked by Xs, as shown below. Snow-covered areas may be marked by Xs using conspicuously coloured dye.

Crosses applied to runways are white in colour and placed with a maximum spacing of 300 m. For taxiways, the crosses are yellow in colour and placed at each end of the closed portion.

For helicopter FATOs, the cross is white in colour. For other helicopter areas such as helicopter parking positions, the cross is yellow in colour.



(b) *Direction Sign*: A direction sign has a black inscription on a yellow background and is used to identify the intersecting taxiways toward which an aircraft is approaching. The sign is, whenever possible, positioned to the left-hand side of the taxiway and prior to the intersection. A direction sign will always contain arrows to indicate the approximate angle of intercept. Direction signs are normally used in combination with location signs to provide the pilot with position information. The location sign will be in the centre or datum position. In this configuration, all information on taxiways that require a right turn are to the right of the location sign and all information on taxiways that require left turns are to the left of the location sign.

5.7 UNSERVICEABLE AREA MARKINGS

Unserviceable portions of the movement area other than runways and taxiways are delineated by markings such as marker boards, cones, or red flags and, where appropriate, a flag or suitable marker is placed near the centre of the unserviceable area. Red flags are used when the unserviceable portion of the movement area is sufficiently small for it to be by-passed by aircraft without affecting the safety of their operations.

5.8 AIRSIDE GUIDANCE SIGNS

5.8.1 General

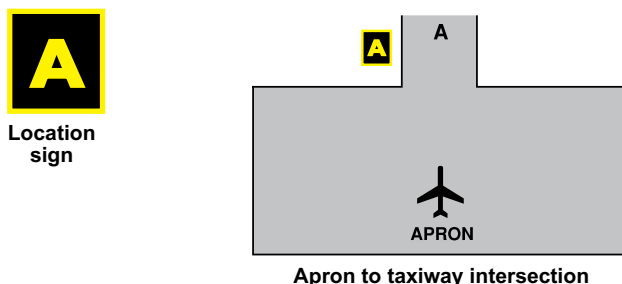
The primary purpose of airside guidance signs is to provide direction and information to pilots of taxiing aircraft for the safe and expeditious movement of aircraft on the aprons, taxiways and runways.

Airside guidance signs are divided into two categories by using colours to differentiate between signs that provide guidance or information and signs that provide mandatory instructions.

5.8.2 Operational Guidance Signs

Operational guidance signs provide directions and information to pilots. The inscriptions incorporate arrows, numbers, letters or pictographs to convey instructions, or to identify specific areas.

(a) *Location Sign*: A location sign has a yellow inscription on a black background and is used to identify the taxiway which the aircraft is on or is entering. A location sign never contains arrows.

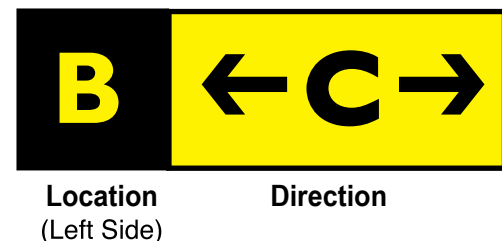


Direction

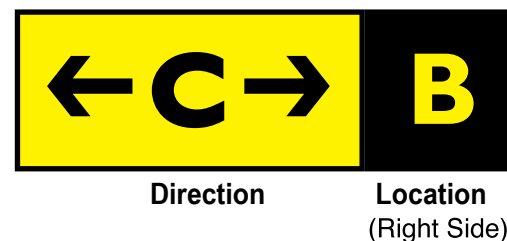
Location

Direction

The only exception to this rule is for a simple “T” or “+” intersection. In this case, the location sign and direction sign may be as depicted below.

Location
(Left Side)

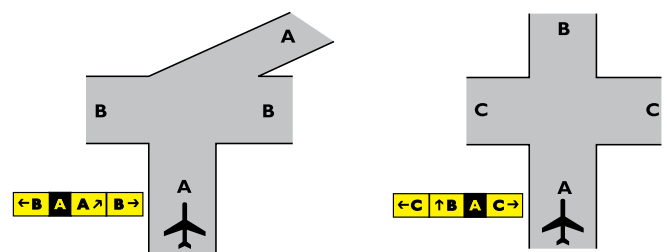
Direction



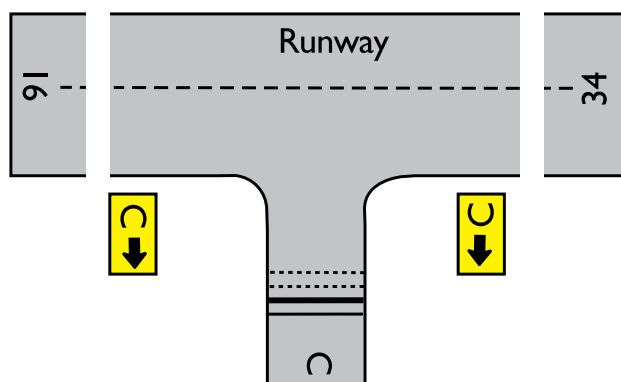
Direction

Location
(Right Side)

When a taxiway continues through the intersection and changes heading by more than 25° or changes its designation, a direction sign will indicate this fact.



- (c) *Runway Exit Signs:* A runway exit sign has a black inscription on a yellow background and is used to identify a taxiway exiting a runway. The sign is positioned prior to the intersection on the same side of the runway as the exit. The sign will always contain an arrow and will indicate the approximate angle that the taxiway intersects the runway. When a taxiway crosses a runway, a sign will be positioned on both sides of the runway. Runway exit signs may be omitted in cases where aircraft do not normally use the taxiway to exit or in cases of one-way taxiways.



- (d) *Destination Signs:* A destination sign has a black inscription on a yellow background and is used to provide general guidance to points on the airfield. These signs will always contain arrows. The use of destination signs will be kept to a minimum. Airports with a good direction sign layout will have little need for destination signs.



- (e) *Other Guidance Signs:* Other guidance signs have a black inscription on a yellow background and include information such as stand identification, parking areas and frequency.



5.8.3 Mandatory Instruction Signs

Mandatory instruction signs are used to identify mandatory holding positions where pilots must receive further ATC clearance to proceed. At uncontrolled aerodromes, pilots are required to hold at points marked by these signs until they have ascertained that there is no air traffic conflict. Mandatory instruction signs have white letters, numbers or symbols against a red background.

- (a) *Holding Position Sign:* A holding position sign is installed at all taxiway-to-runway intersections at certified

aerodromes. A normal holding position sign is used for runways certified for VFR, IFR non-precision, and IFR precision CAT I operations. The sign, when installed at the runway end, shows the designator of the departure runway. Signs installed at locations other than the runway ends shall show the designator for both runways. A location sign is positioned in the outboard position beside the runway designator. A sign will be installed at least on the left side of the taxiway in line with the hold position markings. It is recommended that signs be installed on both sides of the taxiway.

In the following examples, “A” shows that an aircraft is located on Taxiway “A” at the threshold of Runway 25. The second example has the aircraft on Taxiway “B” at the intersection of Runway 25/07. The threshold of Runway 25 is to the left and Runway 07 to the right.



For airports located within the NDA, the same rules apply, except that the sign shows the exact true azimuth of the runway(s).

Northern Domestic Airspace



Location Runway Intersection

Holding position signs are also installed at runway-to-runway intersections when one runway is used regularly as a taxi route to access another runway or where simultaneous intersecting runway operations are authorized. In both cases, the signs are installed on each side of the runway.



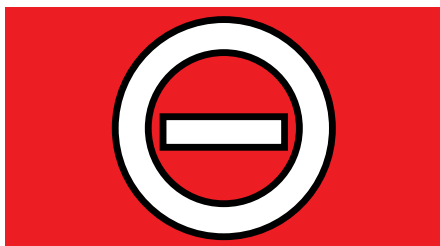
- (b) *Category II and Category III Holding Position Signs:* CAT II and CAT III holding position signs are installed to protect the ILS or MLS critical area during CAT II and CAT III operations. A sign is installed on each side of the taxiway in line with the CAT II/III hold position marking. The inscription will consist of the designator of the runway and the inscription CAT II, CAT III or CAT II/III as appropriate.



CAT II Hold Position

NOTE: Where only one holding position is necessary for all categories of operation, a CAT II/III sign is not installed. In all cases, the last sign before entering a runway will be the normal holding position sign.

- (c) *No Entry Sign:* A no entry sign, as shown below, will be located on both sides of a taxiway into which entry is prohibited.



NO ENTRY

5.8.4 Illumination of Airside Guidance Signs

Airside guidance signs are illuminated at airports which are used at night or in low visibility. Signs, which are illuminated internally, may be of two types. In one case, the sign face is constructed from material, such as plexiglass, which permits the entire sign face to be illuminated. In the other case, the sign faces incorporate imbedded fibre optic bundles which illuminate the individual letters, numbers and arrows, not the face of the sign. At night or in low visibility, pilots approaching a fibre optic sign will see RED illuminated characters on mandatory instruction signs, YELLOW characters on a location sign, and WHITE characters on all other information signs.

NOTE: At the present time and for several years to come, signs not conforming to this convention will continue to be used. There are still airports which have signs with white characters on a green background. Pilots should be aware of the possibility of confusion, particularly when operating at unfamiliar airports.

5.9 WIND DIRECTION INDICATORS

At aerodromes that do not have prepared runways, the wind direction indicator is usually mounted on or near some conspicuous building or in the vicinity of the general aircraft parking area.

Runways greater than 1 200 m in length will have a wind direction indicator for each end of the runway. It will be located 150 m in from the runway end and 60 m outward, usually on the left side.

Runways 1 200 m in length and shorter will have a wind direction indicator centrally located so as to be visible from approaches and the aircraft parking area. Where only one runway exists, it will be located at the mid-point of the runway 60 m from the edge.

For night operations the wind direction indicator will be lighted.

NOTE: At aerodromes certified as airports, a dry Transport Canada standard Wind Direction Indicator will react to wind speed as follows:

WIND SPEED	WIND INDICATOR ANGLE
15 kt or above	Horizontal
10 kt	5° below horizontal
6 kt	30° below horizontal

At aerodromes not certified as airports, non-standard wind indicator systems may be in use which could react differently to wind speed.

6.0 OBSTRUCTION MARKING AND LIGHTING

6.1 GENERAL

Where it is likely that a building, structure or object, including an object of natural growth, is hazardous to aviation safety because of its height and location, the owner, or other person in possession or control of the building, structure or object, may be ordered to mark it and light it in accordance with the requirements stipulated in standard 621.19 to the *Canadian Aviation Regulations* (CARs), Standards Obstruction Markings.

Except in the vicinity of an airport where an airport zoning regulation has been enacted, Transport Canada has no authority to control the height or location of structures. However, all objects, regardless of their height, that have been assessed as constituting a hazard to air navigation require marking and/or lighting in accordance with the CARs and should be marked and/or lighted to meet the standards specified in CAR 621.19.

6.2 STANDARDS

The following obstructions should be marked and/or lighted in accordance with the standards specified in CAR 621.19:

- any obstruction penetrating an airport obstacle limitation surface as specified in TP 312, *Aerodrome Standards and Recommended Practices*;
- any obstruction greater than 90 m AGL within 3.7 km of the imaginary centreline of a recognized VFR route, including but not limited to a valley, a railroad, a transmission line, a pipeline, a river or a highway;
- any permanent catenary wire crossing where any portion of the wires or supporting structures exceeds 90 m AGL;
- any obstructions greater than 150 m AGL; and
- any other obstruction to air navigation that is assessed as a likely hazard to aviation safety.

6.3 REQUIREMENTS FOR AN AERONAUTICAL EVALUATION

Because of the nature of obstructions, it is not possible to fully define all situations and circumstances. Thus, in certain cases, a Transport Canada aeronautical evaluation will be required to determine whether an obstruction to air navigation is a likely hazard to aviation safety or to specify alternative methods of complying with the obstacle marking and lighting standards while ensuring that the visibility requirement is met.

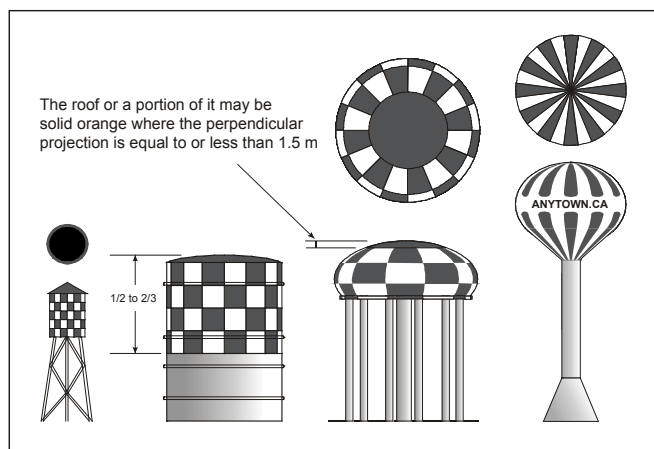
An aeronautical evaluation may be performed with respect to the following types of obstructions:

- (a) obstructions greater than 90 m AGL but not exceeding 150 m AGL;
- (b) catenary wire crossings, including temporary crossings, where the wires or supporting structures do not exceed 90 m AGL;
- (c) obstructions less than 90 m AGL; and
- (d) any other obstruction specified in CAR 621.19.

6.4 MARKING

Day marking of obstructions that are 150 m AGL in height or less, such as poles, chimneys, antennas, and cable tower support structures, may consist of alternate bands of aviation orange and white paint. A checkerboard pattern may be used for water tanks, as shown below. Where a structure is provided with medium or high-intensity white flashing strobe lighting systems that are operated during the day, paint marking of the structure may be omitted.

Figure 6.4.1: Storage Tank Marking



6.5 LIGHTING

Lighting is installed on obstructions in order to warn pilots of a potential collision.

The required intensity for this lighting is based upon an “acquisition distance” from which the pilot would recognize the lighting as identifying an obstruction, and be able to initiate evasive action to miss the obstruction by at least 600 m. For an aircraft operating at 165 KIAS, the acquisition distance is 1.90 km. For an aircraft operating between 165 and 250 KIAS, the acquisition distance is 2.38 km.

A variety of lighting systems are used on obstructions. The table below indicates the characteristics of light units according to their name or designation. Although these designations are similar to those of the FAA, the photometric characteristics (intensity distribution) are not necessarily the same.

CL-810 steady-burning red obstruction light

- Used primarily for night protection on smaller structures and for intermediate lighting on antennas of more than 45 m.

CL-856 high-intensity flashing white obstruction light, 40 flashes per minute (fpm)

- Used primarily for high structures and day protection on antennas where marking may be omitted.

CL-857 high-intensity flashing white obstruction light, 60 fpm

- Lighting of catenary crossings

CL-864 flashing red obstruction light, 20–40 fpm

- Used for night protection of extensive obstructions and antennas of more than 45 m.

CL-865 medium-intensity flashing white obstruction light, 40 fpm

- When operated 24 hr, paint marking may be omitted.

CL-866 medium-intensity flashing white obstruction light, 60 fpm

- White catenary lighting

CL-885 flashing red obstruction light, 60 fpm

- Red catenary light

Table 1: Light Unit Characteristics

Name	Colour	Intensity	Intensity Value (candelas)	Signal Type	Flash Rate flashes per minute
CL-810	red	low	32	steady burning	n/a
CL-856	white	high	200 000	flashing	40
CL-857	white	high	100 000	flashing	60
CL-864	red	medium	2 000	flashing	20 – 40
CL-865	white	medium	20 000	flashing	40
CL-866	white	medium	20 000	flashing	60
CL-885	red	medium	2 000	flashing	60

Rotating Obstruction Light

The majority of flashing obstruction light units are of a strobe (capacitor discharge) design. An exception is one type of CL-865 medium-intensity flashing light, which is of a rotating design, i.e. the light display is produced by rotating lenses. Since this particular light unit might otherwise be mistaken for an aerodrome beacon, colour coding is used to produce a sequenced display of white, white, red, white, white, and red.

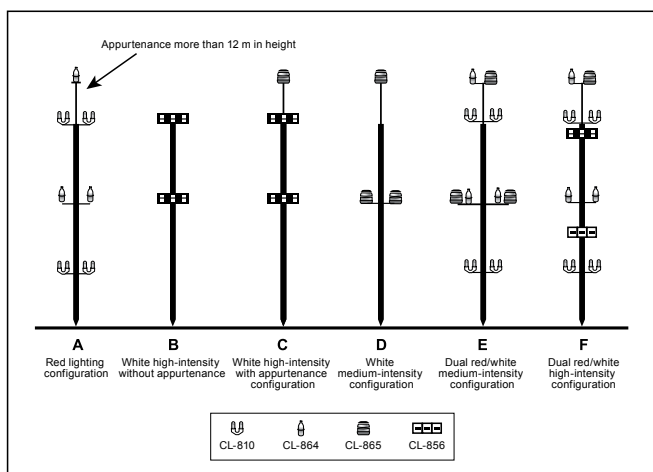


The rotating type CL-865 also has the same 20 000 candela intensity for nighttime as for daytime operation. The absence of dimming is allowed for two reasons: (1) the specified intensities are minimum requirements and (2) the rotating characteristic does not produce glare to the pilot.

Tower Configurations

Depending on the height of the tower and other factors, the installation on towers and antennas may vary as shown in the figure below.

Configurations of Lighting on Skeletal Structures



6.6 APPURTENANCES

Where an obstruction is provided with a red obstruction lighting system, any appurtenance 12 m in height will require an obstruction light at the base of the appurtenance. Where such an appurtenance is more than 12 m in height, the light must be installed on the top of the appurtenance. If the appurtenance is not capable of carrying the light unit, the light may be mounted on the top of an adjacent mast.

Where a high-intensity white flashing lighting system is required, appurtenances higher than 12 m in height will require a top-mounted medium-intensity white flashing omnidirectional light unit.

6.7 SUSPENDED CABLE SPAN MARKINGS

Suspended cable spans, such as power line crossings, assessed as being hazardous to air navigation are normally marked with coloured balls suspended from a messenger cable between the top of the support towers. The support towers are obstruction painted. When painting the support towers is not practical, or to provide added warning, shore markers painted international orange and white will be displayed. In some cases, older marker panels that have not been updated are of a checkerboard design.

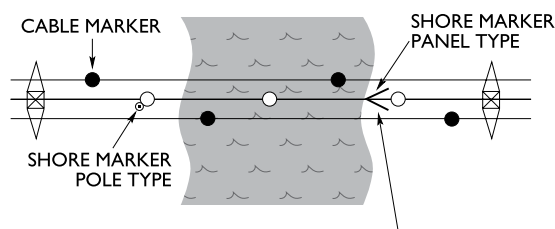
An alternative method of marking is to use strobe lights on shore-based cable support towers. Normally three levels of lights are installed as follows: one light unit at the top of the structures to provide 360° coverage; two light units on each structure at the base of the arc of the lowest cable; and two light units at a point midway between the top and bottom levels with 180° coverage. The beams of the middle and lower lights are adjusted so that the signal will be seen from the approach direction on either side of the power line. The lights flash sequentially: middle lights followed by the top lights and then the bottom lights in order to display a “fly up” signal to the pilot. The middle light may be removed in the case of narrow power line sags; in this case the bottom lights will flash first then the top lights will flash in order to display a “fly up” signal to the pilot. When determined appropriate by an aeronautical study, medium-intensity white flashing omnidirectional lighting systems may be used on supporting structures of suspended cable spans lower than 150 m AGL.

Obstruction markings on aerial cables (i.e., marker balls) that define aeronautical hazards are generally placed on the highest line for crossings where there is more than one cable. Obstruction markings can also be installed on crossings under the *Navigable Waters Protection Act*. In this case, the marker balls are placed on the lowest power line and are displayed to water craft as a warning of low clearance between the water and an overhead cable.

In accordance with the foregoing, pilots operating at low levels may expect to find power line crossings marked as either an aeronautical hazard or a navigable water hazard. They may be unmarked if it has been determined by the applicable agency to be neither an aeronautical nor a navigable waters hazard. Pilots operating at low altitudes must be aware of the hazards and exercise extreme caution.

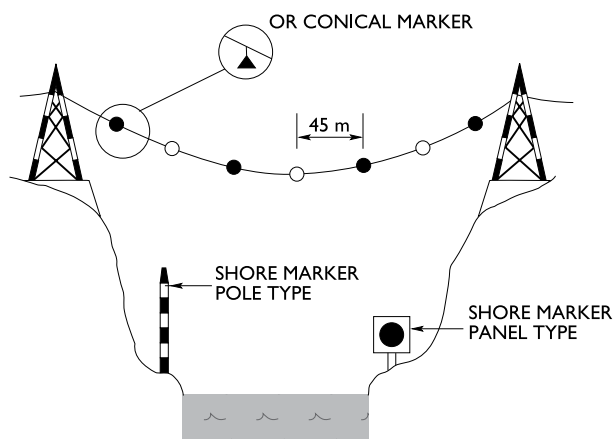
MARKERS FOR CABLE SPAN

TOP VIEW

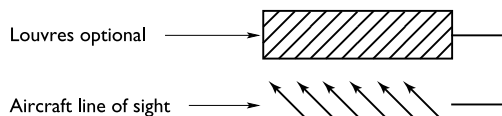


NOTE: For more than one line, markers may be installed alternately.

FRONT VIEW



NOTE: Shore markers are to be securely fixed in place and be sufficiently high off the ground to permit unobstructed vision in both directions. The panel type marker is a 6 m square white panel with a circle centred on the panel.



6.8 AIRCRAFT DETECTION SYSTEMS

New technology has recently been developed so that obstacle lighting is only activated when required to alert pilots who are on a flight path that may lead to a collision with the obstacle. The system has economic benefits and addresses public complaints regarding light pollution.

The system uses radar to detect and track aircraft. The potential for collision with an obstacle is determined by the aircraft's speed and angle of approach. If there is a risk of collision, the lighting turns on and an audio warning is broadcast on the VHF radio. The lighting does not turn on until it is needed by the detected aircraft. Since the system uses radar, no additional equipment needs to be installed on board the aircraft (e.g. transponder).

The obstacle lighting is turned on and the audio warning is emitted approximately 30 s prior to the aircraft reaching the obstacle. In the case of catenaries, the audio warning will state "POWER LINE, POWER LINE." For other types of obstructions, a different message will be sent. In some cases, such as wind farms near aerodromes, an audio signal might not be provided in order to avoid confusing the pilot who is making an approach to landing.

Any questions or comments may be directed to the Transport Canada Flight Standards office in Ottawa.

7.0 AERODROME LIGHTING

7.1 GENERAL

The lighting facilities available at an aerodrome or airport are described in the CFS. Information concerning an aerodrome or airport's night lighting procedures is included as part of the description of lighting facilities where routine night lighting procedures are in effect. Where night lighting procedures are not published for an aerodrome or airport, pilots should contact the aerodrome operator concerned and request that the appropriate lights be turned on to facilitate their intended night operations.

7.2 AERODROME BEACON

Many aerodromes are equipped with a flashing white beacon light to assist pilots in locating the aerodrome at night. The flash frequency of beacons at aerodromes or airports used by aeroplanes is 20 to 30 evenly spaced flashes per minute. The aerodrome beacon may be of the rotating or capacitor discharge type.

The flash frequency of beacons at aerodromes and heliports used by helicopters only is sequenced to transmit the Morse code letter “H” (groups of four quick flashes) at the rate of three to four groups per minute.

7.3 MINIMUM NIGHT LIGHTING REQUIREMENTS AT AERODROMES

Section 301.07 of the CARs requires that any area of land that is to be used as an aerodrome at night shall have fixed (steady) white lights to mark the runway, and fixed red lights to mark unserviceable (hazardous) areas.

Retroreflective markers may be substituted for lights to mark the runway at aerodromes, provided alignment lights are installed (see AGA 7.19 Reflective Markers). This alternative for night marking of runways, however, is not approved for certified sites.

7.4 UNSERVICEABLE AREA LIGHTING

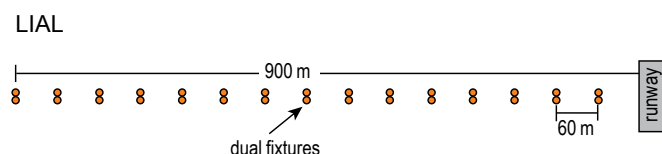
Unserviceable areas within the manoeuvring area of an aerodrome being used at night are marked by steady burning red lights outlining the perimeter of the unserviceable area(s). Where it is considered necessary in the interest of safety, one or more flashing red lights may be used in addition to the steady red lights.

7.5 APPROACH LIGHTING

The approach lighting systems depicted in the CFS include the following:

7.5.1 Non-Precision Approach Runways

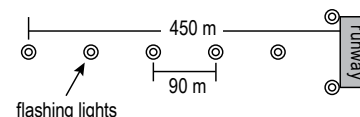
- (a) *Low Intensity Approach Lighting System (LIAL)*: This system is provided on non-precision approach runways and consists of twin aviation yellow fixed-intensity light units spaced at 60-m intervals commencing 60 m from the threshold and extending back for a distance of 900 m (terrain permitting).



- (b) *Omnidirectional Approach Lighting System (ODALS)*:

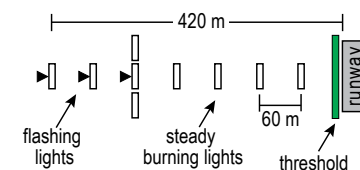
This system is a configuration of seven omnidirectional, variable-intensity, sequenced flashing lights. ODALS provides circling, offset, and straight-in visual guidance for non-precision approach runways. There are five lights on the extended centreline commencing 90 m from the threshold and spaced 90 m apart for 450 m. Two lights are positioned 12 m to the left and right of the threshold. The system flashes towards the threshold, then the two threshold lights flash in unison; the cycle repeats once per second.

ODALS



- (c) *Medium Intensity Approach Lighting System with Sequenced Flashing Lights (MALSF)*: This system consists of seven bars of variable-intensity lights spaced 60 m apart for 420 m commencing at 60 m from the threshold. The three bars farthest away from the threshold contain a sequenced flashing light unit. These lights flash sequentially towards the threshold, repeating at two cycles per second.

MALSF

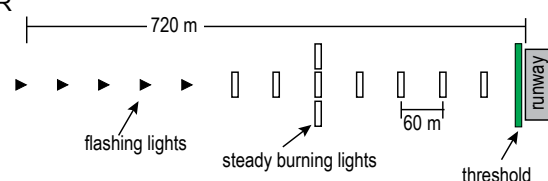


- (d) *Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR)*: This system consists of a variable-intensity approach lighting system extending 720 m from the threshold. This system consists of the following:

- seven bars of light spaced at 60 m over a distance of 420 m; and
- five sequenced flashing lights spaced at 60 m over a further distance of 300 m. These lights flash in sequence towards the threshold at a rate of two cycles per second.

The MALSR has the same configuration as the SSALR, but the lights for the former are PAR 38 and for the latter are PAR 56, which has a higher intensity.

MALSR

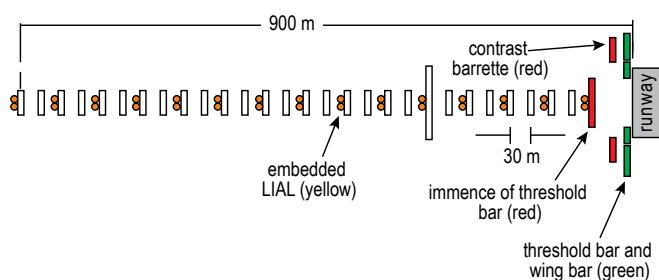


7.5.2 Precision Approach Runways

- (a) **High Intensity Approach Lighting (HIAL) System—CAT I:** This system consists of rows of five white variable-intensity light units spaced at 30 m intervals commencing 90 m from the threshold and extending back for a distance of 900 m (terrain permitting). Additional light bars have been added to the low intensity system (incorporated in this system) because of the lower landing minimum. These are as follows:

- (i) approach threshold bar (green)
- (ii) contrast bars (red)
- (iii) imminence of threshold bar (red)
- (iv) 300 m distance bar (white)

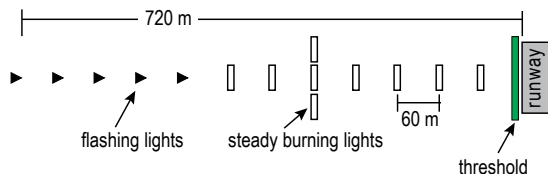
HIAL - CAT I



- (e) **Simplified Short Approach Lighting System with Runway Alignment Indicator Lights (SSALR):** This system consists of a variable-intensity approach lighting system extending 720 m from the threshold. This system consists of the following:

- (i) seven bars of light spaced at 60 m over a distance of 420 m; and
- (ii) five sequenced flashing lights spaced at 60 m over a further distance of 300 m. These lights flash in sequence towards the threshold at a rate of two cycles per second.

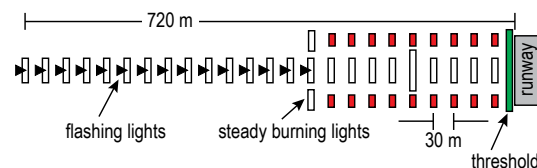
SSALR



- (c) **Approach Lighting System with Sequenced Flashers—CAT II (ALSF-2):** This system consists of rows of five white variable-intensity light units placed at longitudinal intervals of 30 m commencing 30 m from the threshold and extending for a distance of 720 m. In view of the very low decision height associated with CAT II operations, the following lights are provided in addition to the lights of the CAT I system:

- (i) runway threshold (green)
- (ii) 150 m distance bar (white with red barrettes)
- (iii) side barrettes (red)

ALSF-2



7.6 APPROACH SLOPE INDICATOR SYSTEMS

7.6.1 General

An approach slope indicator consists of a series of lights visible from at least 4 NM (2.5 NM for abbreviated installations) designed to provide visual indications of the desired approach slope to a runway (usually 3°). At a certified airport, aircraft following the on-slope signal are provided with safe obstruction clearance to a minimum of 6° on either side of the extended runway centreline out to 4 NM from the runway threshold. Longer runways at certified airports are commonly protected out to 9° on each side of the extended runway centreline. Exceptions will be noted in the CFS. Descent using an approach slope indicator should not be initiated until the aircraft is visually aligned with the runway centreline.

The vertical distance from a pilot's eyes to the lowest portion of the aircraft in the landing configuration is called the eye-to-wheel height (EWH), and this distance varies from less than 4 ft (3 m) to up to 45 ft (14 m) for some wide-bodied aircraft, such as the B-747. Consequently, approach slope indicator systems are related to the EWH for the aircraft that the aerodrome is intended to serve and provide safe wheel clearance over the threshold when the pilot is receiving the on-slope indication.

Pilots and/or air operators must ensure that the approach slope indicator system to be used is appropriate for the given aircraft type, based on the EWH for that aircraft. If this information is not already available in the Aircraft Flight Manual (AFM) or other authoritative aircraft manuals (e.g. Flight Crew Operating Manual [FCOM]), the aircraft manufacturer should be contacted to determine the EWH information for the given aircraft type.

CAUTION: Failure to assess the EWH and approach slope indicator system compatibility could result in decreased terrain clearance margins and in some cases, even premature contact with terrain (e.g. a controlled flight into terrain [CFIT] accident).

The Canadian civil standard for a visual approach slope indicator system is the PAPI. There may be some confusion in terminology, as some airports still have the older systems of visual approach slope indicator (VASI). The VASI and PAPI have the same purpose of descent indication with respect to an approach corridor, but are of a different pattern of light units, as shown below.

The VASI and PAPI have lights normally situated on the left side of the runway only. When available strip widths preclude the use of a full system, an abbreviated approach slope indicator, AV or AP, consisting of only two light units, may be installed.

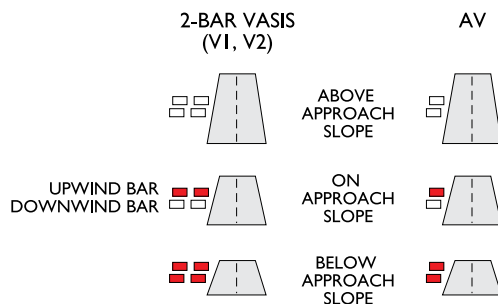
Where a visual approach slope indicator system (PAPI or VASI) is provided on a precision approach runway, it will be turned off in weather conditions of less than 500 ft (150 m) ceiling and/or visibility less than 1 mi., unless specifically requested by the pilot. This is to avoid possible contradiction between the precision approach and VASI/PAPI glide slopes.

7.6.2 Visual Approach Slope Indicator Systems (VASIS)

7.6.2.1 2-BAR VASI (V1 and V2)

The 2-BAR VASI (V1 and V2) consists of four light units situated on the left side of the runway in the form of a pair of wing bars, referred to as the upwind and downwind wing bars. The wing bars project a beam of white light in the upper part and a red light in the lower part.

- On the approach slope, the upwind bar will show red and the downwind bar will show white.
- Above the approach slope, both upwind and downwind bars will show white.
- Below the approach slope, both upwind and downwind bars will show red.
- Well below the approach slope, the lights of the two wing bars will merge into one red signal.



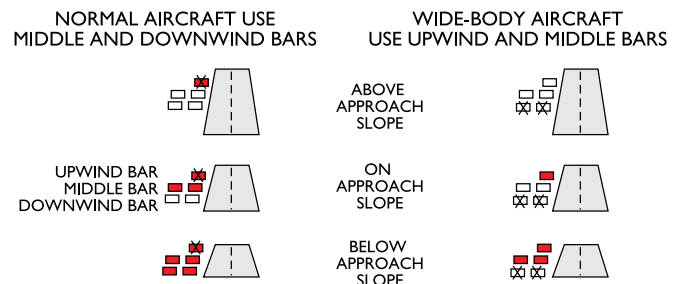
7.6.2.2 3-BAR VASI (V3)

The 3-BAR VASI (V3) is basically a 2-BAR VASI (V2), with one light unit added to form an additional upwind bar. This provides a greater threshold wheel clearance for aircraft with a large EWH (a wide body). The system then consists of three wing bars:

- upwind bar (added);
- middle bar (upwind bar of V2); and
- downwind bar of V2.

Wide-bodied aircraft use the upwind and middle bars to provide safe wheel clearance, and conventional aircraft (up to 25 ft (7.5 m) EWH) use the middle and downwind bars, as with V2.

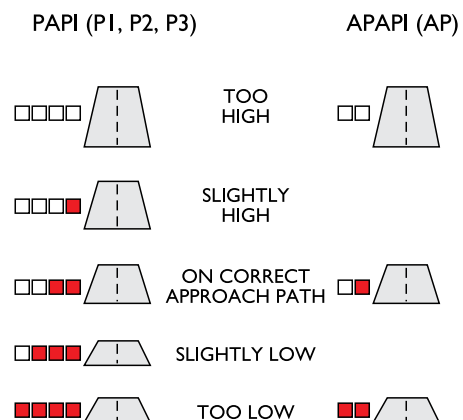
Where VASI is provided on a precision approach runway, it will be turned off in weather conditions of less than 500 ft (150 m) ceiling and/or visibility less than 1 mi., unless specifically requested by the pilot. This is to avoid possible contradiction between the precision approach and VASI glide paths.



7.6.2.3 Precision Approach Path Indicator (PAPI)

PAPI consists of four light units situated on the left side of the runway in the form of a wing bar.

- On the approach slope, the two units nearest the runway show red, and the two units farthest from the runway show white.
- Slightly above the approach slope, the one unit nearest the runway shows red and the other three show white.
- Further above the approach slope, all four units show white.
- Slightly below the approach slope, the three units nearest the runway show red and the other shows white.
- Well below the approach slope, all four units show red.



7.6.3 Categories According to EWH in the Approach Configuration

7.6.3.1 General

Approach slope indicator systems are categorized according to the EWH in the approach configuration, as shown in tables 7.1 and 7.2 below:

NOTE: The EWH is the vertical distance of the eye path to the wheel path as shown in Figure 7.1. and is determined by the glide slope angle and the pitch angle for the maximum certified landing weight at V_{ref} . This should not be confused with dimensions as may be measured when the aircraft is on the ground.

7.6.3.2 VASI Categories

The VASI systems are designed for aircraft height groups as indicated in Table 7.1 for categories AV, V1, V2 and V3. The greater the value of the EWH in the approach configuration, the farther the VASI is installed upwind from the threshold to enable a minimum eye height over threshold (MEHT).

Table 7.1 VASI Categories

Category	System	Aircraft height group EWH in the approach configuration
AV	2-BAR VASI	0 ft (0 m) < 10 ft (3 m)
V1	2-BAR VASI	0 ft (0 m) < 10 ft (3 m)
V2	2-BAR VASI	10 ft (3 m) < 25 ft (7.5 m)
V3	3-BAR VASI	25 ft (7.5 m) < 45 ft (14 m)

< means up to but not including

7.6.3.3 PAPI Categories

The PAPI is designed for aircraft height groups as indicated in Table 7.2 for categories AP, P1, P2 and P3. The greater the value of the EWH in the approach configuration, the farther the PAPI is installed upwind from the threshold to enable an MEHT.

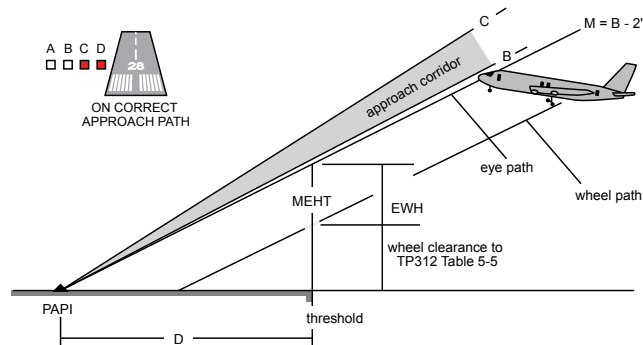
Table 7.2 PAPI Categories

Category	Aircraft height group EWH in the approach configuration
AP	0 ft (0 m) < 10 ft (3 m)
P1	0 ft (0 m) < 10 ft (3 m)
P2	10 ft (3 m) < 25 ft (7.5 m)
P3	25 ft (7.5 m) < 45 ft (14 m)

< means up to but not including

The PAPI case also is shown in Figure 7.1. The approach corridor is defined by the setting angles of units C and B. The MEHT is defined by the angle M, which is 2 min of arc below the angle B. This accounts for the pink transition sector. The available MEHT is the sum of the EWH and the prescribed wheel clearance. The distance D for location of the PAPI from the threshold is calculated using the tangent of the angle M.

Figure 7.1 PAPI: Pilot eye path to wheel path



7.6.4 Knowing your EWH

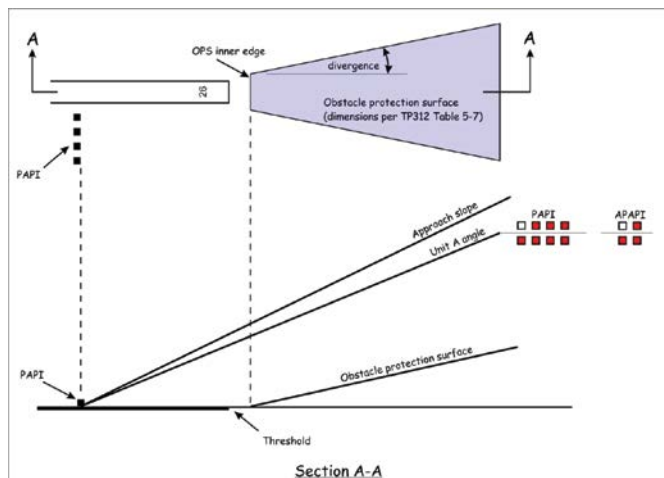
7.6.4.1

As illustrated in Figure 7.1, for a particular category of PAPI, there is an available wheel clearance, which is why knowing the EWH in the approach configuration is important. If your aircraft belongs in the aircraft height group for P3 PAPI, using a P2 PAPI means having much less wheel clearance at threshold crossing. Figure 7.1 also shows why, in general, flying the system with indication as being below the approach corridor (e.g. three red and one white) is not recommended.

7.6.5 Obstacle Protection Surface

The installation of a PAPI or an APAPI requires the establishment of an obstacle protection surface (OPS). The OPS is referenced to the angle A which for PAPI is the transition from 1 white light and 3 red lights to 4 red lights, and for APAPI is the transition from 1 white light and 1 red light to 2 red lights, as shown in Figure 7-2. Objects should not penetrate the OPS. Where an object or terrain protrudes above the OPS and beyond the length of the approach OLS, one of a number of possible measures may be taken such as raising the approach slope or moving the PAPI further upwind of the threshold.

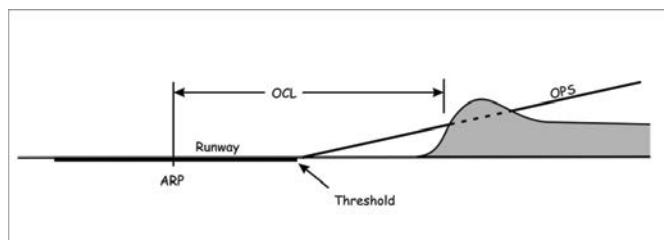
Figure 7-2. PAPI/APAPI Obstacle Protection Surface



7.6.6 Obstacle Clearance Limit

At some aerodromes, particularly in mountainous regions, the PAPI is not useable at the full extent of its range. This occurs primarily because of terrain that penetrates the OPS. At sites such as Castlegar, Kelowna and Penticton in British Columbia, an OCL is established as the distance from the ARP to the obstacle and published in the CFS. A pilot should not use the PAPI display until within the OCL.

Figure 7-3. Obstacle Clearance Limit



7.7 RUNWAY IDENTIFICATION LIGHTS

7.7.1 Runway Identification Lights (RILS)

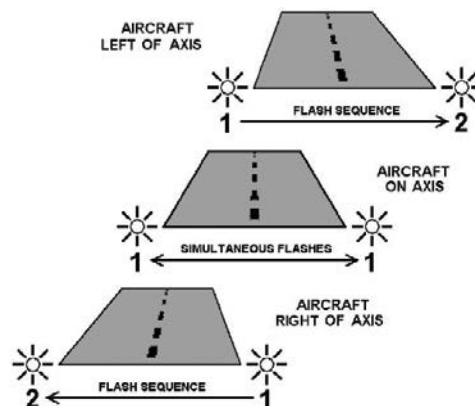
These are provided at aerodromes where terrain precludes the installation of approach lights, or where unrelated non-aeronautical lights or the lack of daytime contrast reduces the effects of approach lights. Aerodromes equipped with RILS are listed in the CFS and the RILS system is indicated by the notation “AS”.

RILS are operated to accommodate arriving aircraft as follows:

- (a) *by day*: when the visibility is 5 mi. or less, they are turned on and will be left on unless the pilot requests that they be turned off.
- (b) *by night*: these lights are operated in conjunction with the approach and runway lights, but can be turned off at the pilot's request.

7.7.2 Visual Alignment Guidance System (VAGS)

The VAGS consists of two lights similar to those used in RILS. However, by means of light beam rotation, the pilot is presented with a sequenced display, as shown in the figure below. The display directs the pilot towards the runway/helipad axis, where he or she then sees the lights flash simultaneously.



7.8 RUNWAY LIGHTING

A runway that is used at night shall display 2 parallel lines of fixed white lights visible for at least 2 mi. to mark take-off and landing areas. These lights are arranged so that:

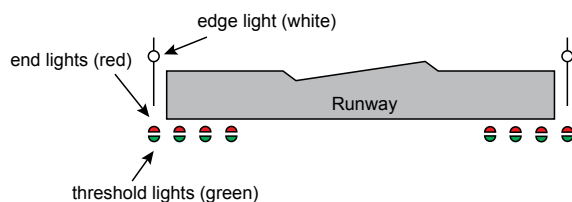
- the minimum distance between parallel lines is 23 m, and the maximum is 60 m;
- the maximum distance between lights in the parallel lines is 60 m; and
- each light in the parallel lines is aligned opposite the other and at right angles to the centreline of the take-off and landing area.

7.8.1 Runway Edge Lights

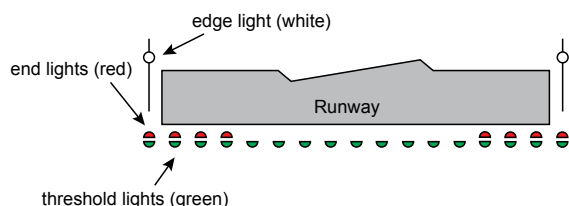
These are variable-intensity white lights at the runway edges along the full length of the runway spaced at 60-m intervals, except at intersections with other runways. On some runways, a 600-m section of lights or the last third of the runway at the remote end—whichever is shorter—may show yellow. The units are light in weight and mounted in a frangible manner.

7.8.2 Runway Threshold End Lights

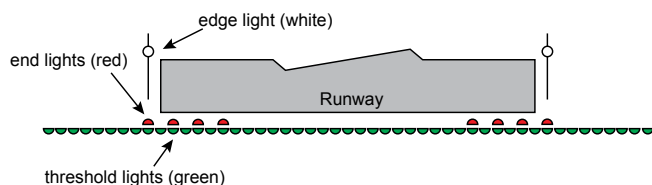
Runway threshold/end indication is provided by green and red light units in the form of a pair of bars along the threshold on each side of the runway centreline, where there is an ODALS or no approach lighting. Red shows in the direction of takeoff and green shows in the approach direction.



Where approach lighting such as MALS, MALSF or SSALR is provided, the green threshold lighting extends along the full width of the runway.

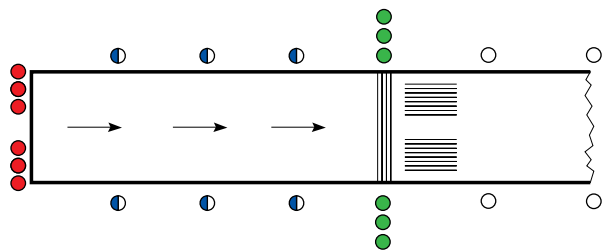


Where an ALSF-2 is provided, the green threshold lighting is extended farther as wing bars to each side of the runway.



7.9 DISPLACED RUNWAY THRESHOLD LIGHTING

Where runway thresholds have been displaced they are lighted as follows:



DISPLACED RUNWAY THRESHOLD LIGHTING

7.10 RUNWAY CENTRELINE LIGHTING

Runway centreline lighting is provided on CAT II and CAT III runways. It consists of variable-intensity lights installed on the runway surface spaced at intervals of 15 m. The lights leading in the take-off or landing direction are white to a point 900 m from the runway end. They then change to white and red until 300 m from the runway end, at which point they become red.

7.11 RUNWAY TOUCHDOWN ZONE LIGHTING

Touchdown zone variable intensity white lights are provided on CAT II and CAT III instrument runways. They consist of bars of three inset lights per bar disposed on either side of the runway centreline, spaced at 30 m intervals commencing 30 m from the threshold, extending 900 m down the runway. The lights are unidirectional, showing in the direction of approach to landing.

7.12 RAPID-EXIT TAXIWAY LIGHTING

Rapid-exit taxiway lights are alternating green and yellow in colour and are installed on the runway surface commencing approximately 60 m before the turn and continuing with the alternating colours until beyond the HOLD position. Once beyond the HOLD position, the colour pattern reverts to continuous green.

7.13 TAXIWAY LIGHTING

Taxiway edge lights are blue in colour and are spaced at 60-m intervals. Where a taxiway intersects another taxiway or a runway, two adjacent blue lights are placed at each side of the taxiway. To facilitate the identification of the taxiway entrance on departure from the apron, the intersection of an apron with a taxiway is indicated by two adjacent yellow lights at taxiway/apron corners.

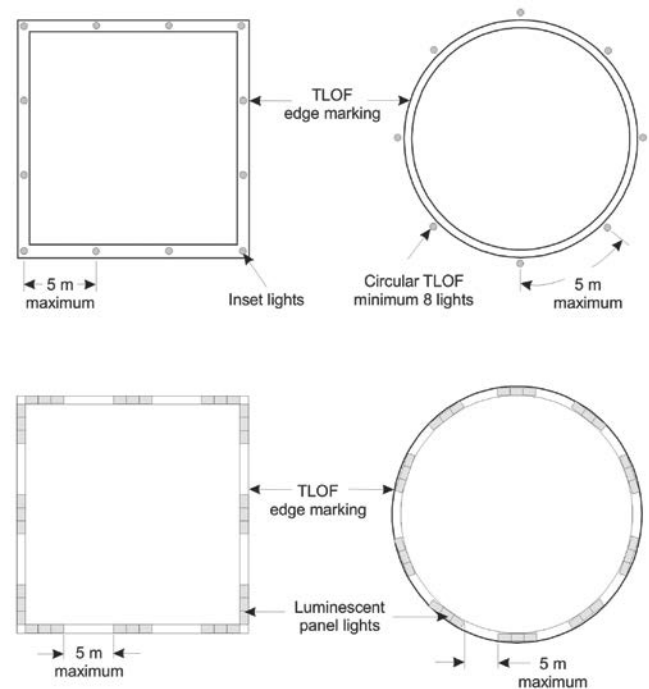
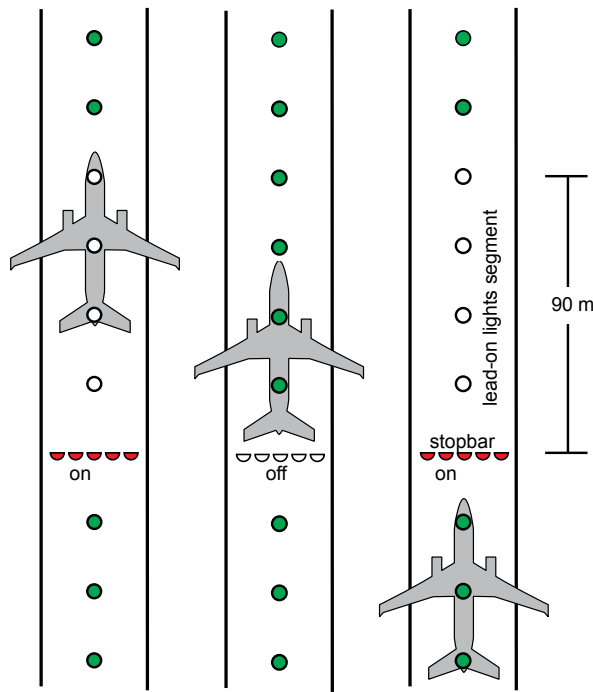
Taxiway centreline lights are green in colour and are installed on the taxiway surface. They are spaced at 15-m intervals with less spacing on taxiway curves.

7.14 STOP BARS

Stop bars are provided at every taxi-holding position serving a runway when it is intended that the runway will be used in visibility conditions below RVR1200 ($\frac{1}{4}$ SM). Stop bars are located across the taxiway at the point where it is desired that traffic stop and consist of lights spaced at intervals of 3 m across the taxiway. They appear showing red in the intended direction of approach to the intersection or taxi-holding position.

Where the stop bar is collocated with taxiway centreline lighting, a 90-m segment of the taxiway centreline lighting beyond the stop bar is turned off when the stop bar is illuminated. The stop bar is illuminated again after a timed duration or by means of sensors installed on the taxiway.

One should never cross an illuminated stop bar, even with a clearance from ATC.



Examples of TLOF lighting

AGA

7.15 RUNWAY GUARD LIGHTS

Runway guard lights are provided at each taxiway/runway intersection to enhance the conspicuity of the holding position for taxiways supporting runway operations below a visibility value of RVR2600 ($\frac{1}{2}$ SM). They consist of yellow unidirectional lights that are visible to the pilot of an aircraft taxiing to the holding position, but their configuration may vary:

- They can consist of a series of lights spaced at intervals of 3 m across the taxiway. Where this is the case, the adjacent lights illuminate alternately and even lights illuminate alternately with odd lights; or
- They can consist of two pairs of lights, one on each side of the taxiway adjacent to the hold line. Where this is the case, the lights in each unit illuminate alternately.

7.16 HELIPORT LIGHTING

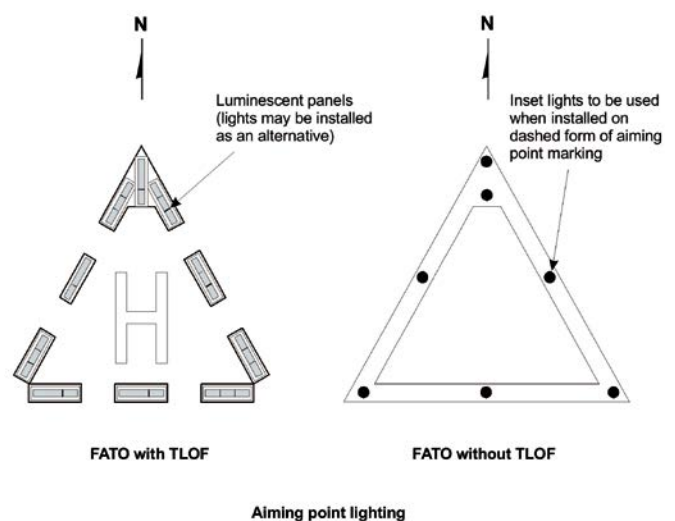
Where a heliport is used at night, the perimeter of the TLOF may be lighted by yellow perimeter lights or by floodlighting.

- Yellow perimeter lights:** Where the TLOF is circular, no fewer than eight yellow lights are used to mark the perimeter. In a rectangular layout, the perimeter is marked by a minimum of four yellow lights on each side, with a light at each corner.
- Floodlighting:** When provided, the floodlighting will illuminate the TLOF such that the perimeter marking of the TLOF is visible. Floodlight units will be located beyond the perimeter of the FATO.

NOTE: Perimeter lighting or reflective tape may be used in addition to floodlighting.

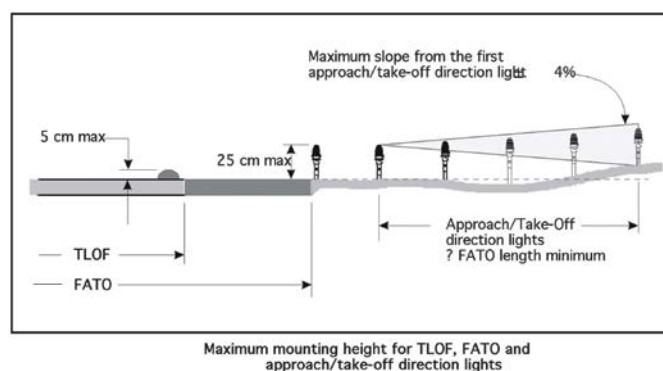
7.16.1 FATO Lighting

A FATO perimeter is marked by white or green lights in the same configuration as the TLOF perimeter lighting. Where a TLOF is not located within a FATO, the aiming point will be defined by at least seven red aeronautical ground lights located on the triangular marking.



7.16.2 Approach/Take-Off Direction Lights

At some heliports, where it is necessary to follow preferred approach and take-off paths to avoid obstructions or noise sensitive areas, the direction of the preferred approach and take-off routes will be indicated by a row of five yellow fixed omnidirectional lights outside the FATO.



7.17 EMERGENCY LIGHTING

Airports with precision approaches (CAT I, II, and III) in Canada are equipped with a secondary power system for visual aids lighting. This system is normally capable of assuming the electrical load within approximately 15 s for CAT I operations, and within 1 s for CAT II and III operations.

7.18 AIRCRAFT RADIO CONTROL OF AERODROME LIGHTING (ARCAL)

ARCAL systems are becoming more prevalent as a means of conserving energy, especially at aerodromes and airports not staffed on a continuous basis or where it is not practicable to install a land line to a nearby FSS. Aside from obstacle lights, some or all of the aerodrome and airport lighting may be radio-controlled.

Control of the lights should be possible when aircraft are within 15 NM of the aerodrome or airport. The frequency range is 118 to 136 MHz.

Activation of the system is via the aircraft VHF transmitter and is effected by depressing the push-to-talk button on the microphone a given number of times within a specified number of seconds. Each activation will start a timer to illuminate the lights for a period of approximately 15 min. The timing cycle may be restarted at any time during the cycle by repeating the specified keying sequence. It should be noted that ARCAL Type K runway identification lights (code AS) can be turned off by keying the microphone three times on the appropriate frequency. The code for the intensity and the lighting period varies for each installation. Consequently, the CFS must be consulted for each installation.

NOTE: Pilots are advised to key the activating sequence when commencing their approach, even if the aerodrome or airport lighting is on. This will restart the timing cycle so that the full 15-min cycle is available for their approach.

7.19 RETROREFLECTIVE MARKERS

Some aerodromes may use retroreflective markers in place of lights to mark the edges of runways or helipads. These retroreflective markers are approved for use on runways at

registered aerodromes only; however, they may be used as a substitute for edge lighting on taxiways or apron areas at some certified airports.

Retroreflective markers are to be positioned in the same manner as runway lighting described in earlier paragraphs of this chapter. Therefore, when the aircraft is lined up on final approach, retroreflective markers will provide the pilot with the same visual presentation as normal runway lighting. A fixed white light or strobe light shall be installed at each end of the runway to assist pilots in locating the aerodrome and aligning the aircraft with the runway. Similarly, retroreflective markers at heliports are to be positioned in the same pattern as prescribed for helipad edge lighting.

The approved standard for retroreflective markers requires that they be capable of reflecting the aircraft landing lights so that they are visible from a distance of 2 NM. Pilots are cautioned that the reflective capabilities of retroreflective markers are greatly affected by the condition of the aircraft landing lights, the prevailing visibility and other obscuring weather phenomena. Therefore, as part of preflight planning to an aerodrome using retroreflective markers, pilots should exercise added caution in checking the serviceability of their aircraft landing lights and making provision for an alternate airport with lighting in case of an aircraft landing light failure.

8.0 AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF)

8.1 GENERAL

Airports obligated to provide ARFF are found in the schedule under CAR 303. Other airports choosing to provide ARFF must do so in accordance with CAR 303.

The primary responsibility of an ARFF service is to provide a fire-free egress route for the evacuation of passengers and crew following an aircraft accident.

8.2 ARFF HOURS OF AVAILABILITY

The aerodromes or airports providing ARFF are required to publish the hours during which an ARFF service is operated in the CFS under the ARFF annotation.

8.3 CLASSIFICATION SYSTEM

The following table identifies the critical category for fire fighting as it relates to the aircraft size, the quantities of water and complementary extinguishing agents, the minimum number of ARFF vehicles and the total discharge capacity. For ease of interpretation, the table is a combination of the two tables found under CAR 303.

Aeroplane Category	Aeroplane Overall Length	Maximum Fuselage Width (metres)	Quantity of Water (litres)	Quantity of Complementary Agents (kilograms)	Minimum Number of Aeroplane Firefighting Vehicles	Total Discharge Capacity (litres per minute)
1	less than 9 m	2	230	45	1	230
2	at least 9 m but less than 12 m	2	670	90	1	550
3	at least 12 m but less than 18 m	3	1 200	135	1	900
4	at least 18 m but less than 24 m	4	2 400	135	1	1 800
5	at least 24 m but less than 28 m	4	5 400	180	1	3 000
6	at least 28 m but less than 39 m	5	7 900	225	2	4 000
7	at least 39 m but less than 49 m	5	12 100	225	2	5 300
8	at least 49 m but less than 61 m	7	18 200	450	3	7 200
9	at least 61 m but less than 76 m	7	24 300	450	3	9 000
10	at least 76 m	8	32 300	450	3	11 200

8.4 ARFF STANDBY REQUEST

Local standby means the level of response when an aircraft has, or is suspected to have, an operational defect. The defect would normally cause serious difficulty for the aircraft to achieve a safe landing.

Full emergency standby means the level of response when an aircraft has, or is suspected to have, an operational defect that affects normal flight operations to the extent that there is possibility of an accident.

When informed that an emergency has been declared by a pilot, the airport ARFF unit will take up emergency positions adjacent to the landing runway and stand by to provide assistance. Once response to an emergency situation has been initiated, the ARFF unit will remain at the increased state of alert until informed that the pilot-in-command has terminated the emergency. After the landing, ARFF will intervene as necessary and, unless the pilot-in-command authorizes their release, escort the aircraft to the apron and remain in position until all engines are shut down.

In order to adequately respond, a pilot request to “stand by in the fire hall” is not appropriate. Pilots are reminded, however, that the ARFF unit will terminate their alert posture when informed by the pilot that the emergency situation no longer exists.

8.5 ARFF DISCREET COMMUNICATION

The capability to communicate on a discreet frequency is normally available at airports that provide ARFF services.

9.0 AIRCRAFT ARRESTING SYSTEMS

9.1 ENGINEERED MATERIAL ARRESTING SYSTEMS (EMAS)

NOTE: No EMAS are currently installed in Canada. This section is being published to educate the aviation community prior to EMAS being installed in Canada.

9.1.1 System Description

EMAS is an arresting system designed for transport category aeroplanes in the event of a runway overrun. An EMAS bed is designed to stop an overrunning aeroplane by exerting predictable deceleration forces on its landing gear as the EMAS material crushes. The strength of the arrester bed is designed to decelerate the aeroplane without structural failure to the landing gear. The beds are made up of a grouping of blocks of crushable cellular concrete that will reliably and predictably crush under the weight of an aeroplane.

In order to arrest an aeroplane overrunning a runway end, EMAS beds are placed beyond the end of a runway and in alignment with the extended runway centerline.



Photograph of an EMAS installation
(The EMAS bed is the grey area under the yellow chevrons)

9.1.2 System Depiction

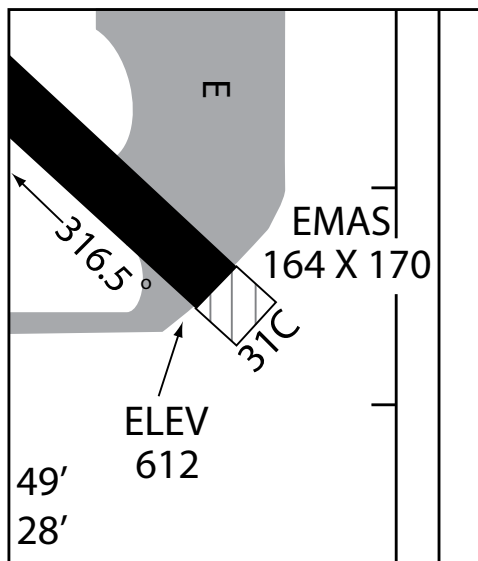
The aerodrome sketch will show the location and dimensions of the EMAS beds. In the example below, the EMAS bed is shown as an outlined box with diagonal lines running through it. The dimensions are provided in feet.

EMAS depiction on an aerodrome sketch

9.1.3 Pilot Considerations for Engagement

Prior to using a runway, pilots should be aware of the presence of an EMAS bed. Pilots should review the aerodrome sketch and other aerodrome information to determine if the runway that they will be using is equipped with an EMAS.

During the take-off or landing phase, if a pilot determines that the aeroplane will exit the runway end and enter the EMAS, the following procedure should be followed:



EMAS depiction on an aerodrome sketch

- (a) continue to follow rejected-takeoff procedures or, if landing, maximum-braking procedures outlined in the aircraft flight manual, regardless of aeroplane speed upon exiting the runway;

- (b) continue straight ahead—do not veer left or right. Having all of the aeroplane's landing gear enter the bed will maximize the EMAS's stopping capability. Veering to the side may result in the aeroplane missing the bed altogether or having only one set of wheels enter the bed with reduced effectiveness. The quality of deceleration will be best within the confines of the bed. The further the aeroplane travels into the bed, and into deeper concrete, the greater the deceleration;
- (c) do not take any action—the arrester bed is a passive system, similar to other traditional arresting systems such as cables, chains and aircraft netting;
- (d) do not attempt to taxi or otherwise move the aeroplane once stopped;
- (e) use standard aircraft emergency ground egress procedures, should an emergency egress be required. Where the surface of the bed has been breached, the loose material will crush underfoot. During egress, it is important to note that the two sides and the back of the arrester bed have continuous steps built in to help provide easy access for responding ARFF vehicles and to enable passengers to safely step off the bed; and
- (f) use slides or aircraft stairs to deplane passengers after an EMAS arrestment as the EMAS bed will not provide a stable base for the air stairs.

9.2 MILITARY AIRCRAFT ARRESTING SYSTEMS

9.2.1 Background

Some civil airports and military aerodromes are equipped with aircraft arresting systems. An aircraft arresting system usually consists of two sets of gear, called energy absorbers, with one located on each side of the runway, normally approximately 460 m from the threshold. These energy absorbers are interconnected by an arrester cable, which is attached to a nylon tape that is wound onto a tape storage drum (reel) on each energy absorber. In order to locate the energy absorbers away from the edge of the runway, runway edge sheaves are located next to the runway edge. The runway edge sheaves act as a guide (pulley) for the tape and have sloped sides to permit an aircraft to roll over them.

When the tailhook of a fighter aircraft engages the cable, the tape storage drums start to turn. The energy absorbers apply a braking force to the storage drums, which in turn slows the aircraft and brings it to a stop.

9.2.2 Markings

For identification, yellow circles are painted across the runway at the location of the aircraft arrester cable. A lighted sign with a yellow circle beside the runway marks the location during darkness.

9.2.3 Operations

At civil airports, civil aeroplane operations will not be permitted while the arrester cable is deployed across the runway. At military aerodromes, civil aeroplane operations may be permitted with the arrester cable deployed across the runway.

9.2.4 Damage Hazards

- (a) Cables: Pilots are advised to avoid crossing the aircraft arrester cable at speeds in excess of 10 mph, as a wave action may develop in the cable, which could damage the aircraft. This is particularly important for nose-wheel aircraft having minimal propeller or undercarriage-door clearance, or wheel fairings. Tail-wheel aircraft may also sustain damage if the tail wheel engages the cable.
- (b) Runway edge sheaves: The runway edge sheaves are located next to the runway edge, on the runway shoulder, and they are above grade. The two sides perpendicular to the runway are sloped, but the other two sides, parallel to the runway, are vertical. The runway edge sheaves are not frangible and may cause damage to an aeroplane that contacts or rolls over one.
- (c) Energy absorbers: The energy absorbers are normally located beside the graded area of the runway strip (at a distance greater than 61 m from the runway centreline). The energy absorbers are not frangible and will cause damage to an aeroplane that contacts one.

9.2.5 Information for Pilots

Pilots will normally be advised of the status of the arrester cable through ATIS or by ATC. The existence of an aircraft arresting system should be included in the runway data section of the CFS. The location of an aircraft arresting system should also be depicted on the aerodrome sketch.

