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DOCUMENT TITLE

GENERAL OPERATIONS, FLIGHT PLANNING AND PERFORMANCE

CHAPTER 15 – AEROPLANE LANDING AREAS

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AEROPLANE LANDING AREAS

An Aeroplane Landing Area (ALA) is an area of ground suitable only for take-off and landing by aircraft with a Maximum Take-Off Weight (MTOW) of less than 5700 kg.

An ALA may be used:

- After the pilot has checked visually that the dimensions of the ALA are suitable prior to landing.
- After the pilot has checked visually that the physical characteristics of the ALA are suitable prior to landing.
- Only when there is method of determining the surface wind (such as a wind-sock).
- After permission has been obtained from the owner (except in an emergency).

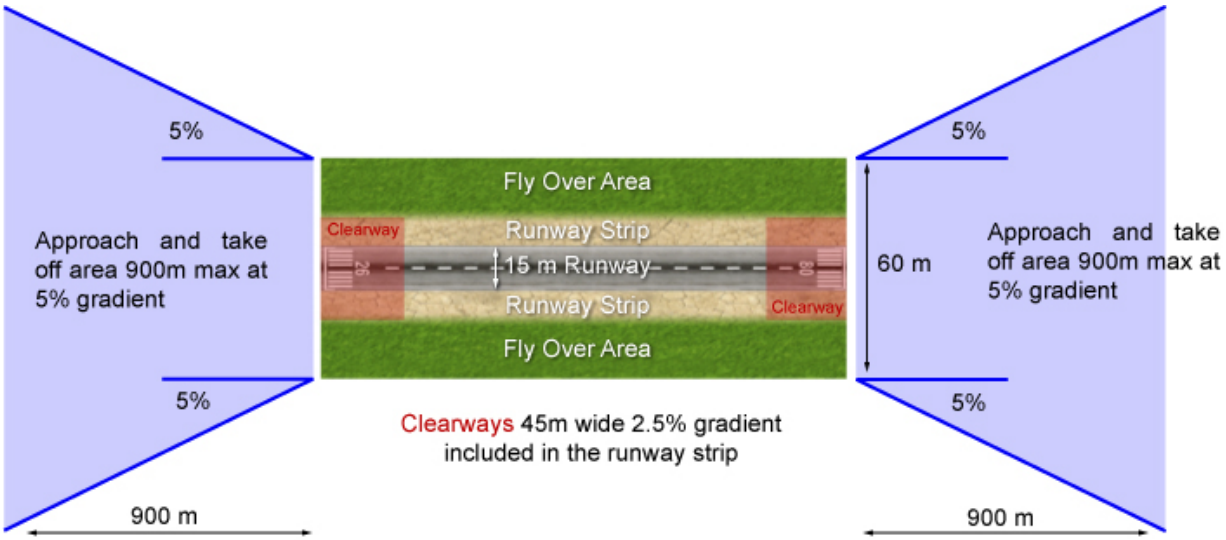
The following definitions are used only when describing an ALA:

- Clearway. An area in which there are no obstacles penetrating a slope of 2.5% rising from the end of runway over a width of 45m.
- Fly-over area. A portion of ground adjacent to the runway strip, which is free of tree stumps, large rocks or stones, fences, wire and any other obstacles that are above ground. The fly-over area may include ditches or drains that are below ground.
- Runway. The part of the ALA intended for use by aircraft taking off or landing.
- Runway strip. The ground between the runway and fly-over area. Its condition must be such that minimal damage will occur to an aircraft if it should run off the runway during take-off or landing.
- Lateral Transitional Slope:– The transitional slope provides greater clearance and some protection from wind shear turbulence created by nearby tall objects

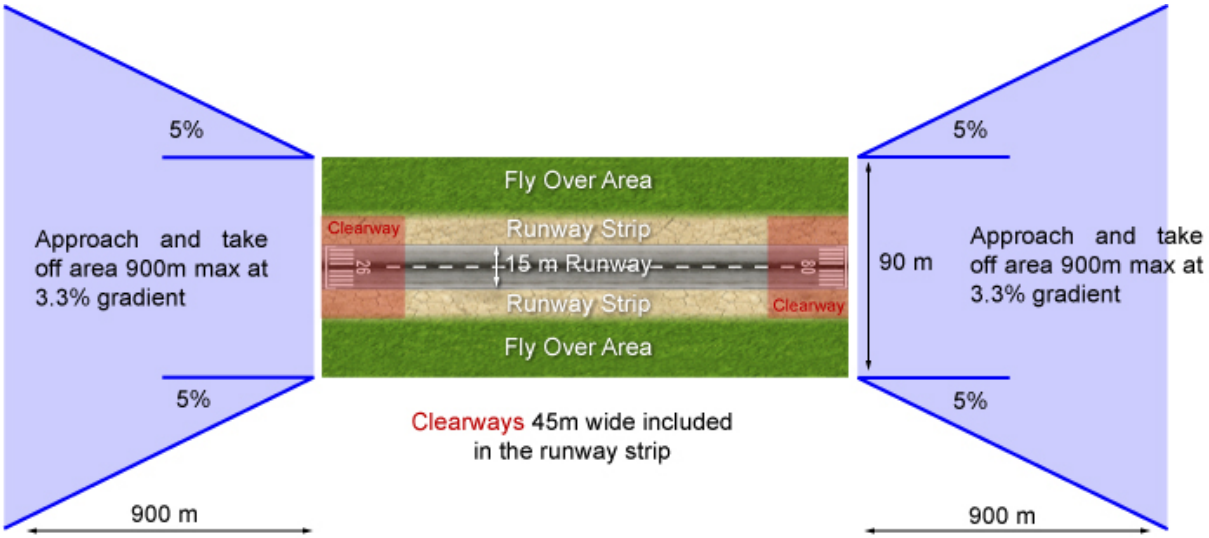
Recommended minimum dimensions of landing areas :

- Runway Width - a minimum runway width of 15 metres is recommended. Single engined aircraft with a MTOW below 2000 kg may operate on runways 10 metres wide.
- Runway Length - the runway length must be equal to or greater than that specified in the aeroplane's Flight Manual or approved performance charts or Certificate of Airworthiness for the prevailing conditions.
- Longitudinal slope between the runways ends shall not exceed 2%.
- Transverse slope across the RWS shall no exceed 2.5%.

ALA dimensions for day operations:



ALA dimensions for night operations:



The transverse slope between extreme edges of the runway strip should not exceed 2.5%.

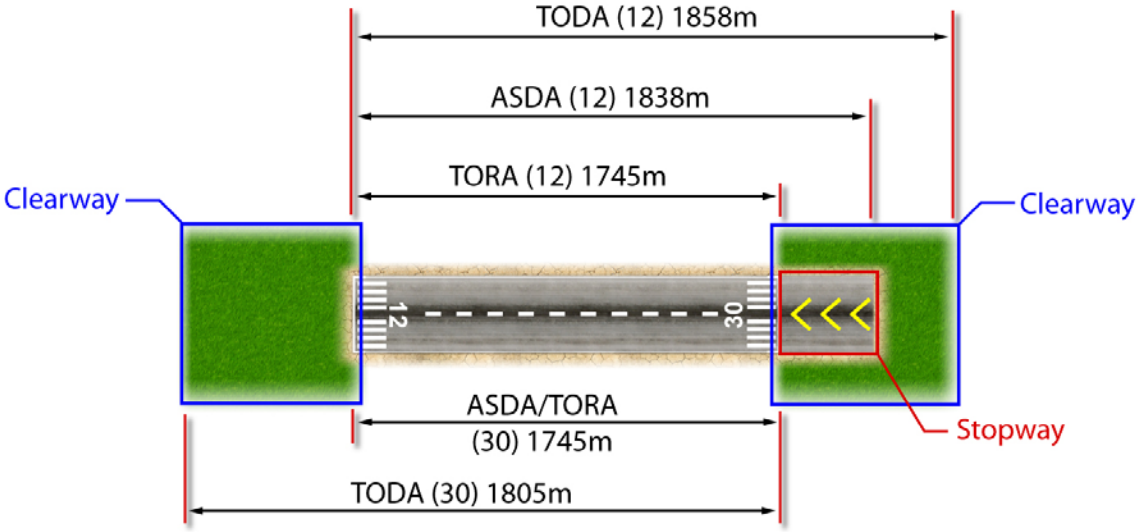
The Approach and Take-off Areas at both ends of the runway should be clear of obstacles above a 5% slope for day and 3.3% slope for night operations. The obstacle free area must extend out from the fly-over area at a splay of 5%.

During a visual inspection of ALA runway surface the pilot looks for long grass or areas of loose gravel present because the performance and tracking of the aircraft could be severely affected. The ALA should not be used if there are visible areas of soft ground or standing water.

Example ALA Lockhard River runway 12 / 30

RWY	TORA	TODA	ASDA	LDA
12	4921' / 1500m	5118' / 1560m (1.73%)	4921' / 1500m	4921' / 1500m
30	4921' / 1500m	5118' / 1560m (2.34%)	4921' / 1500m	4921' / 1500m

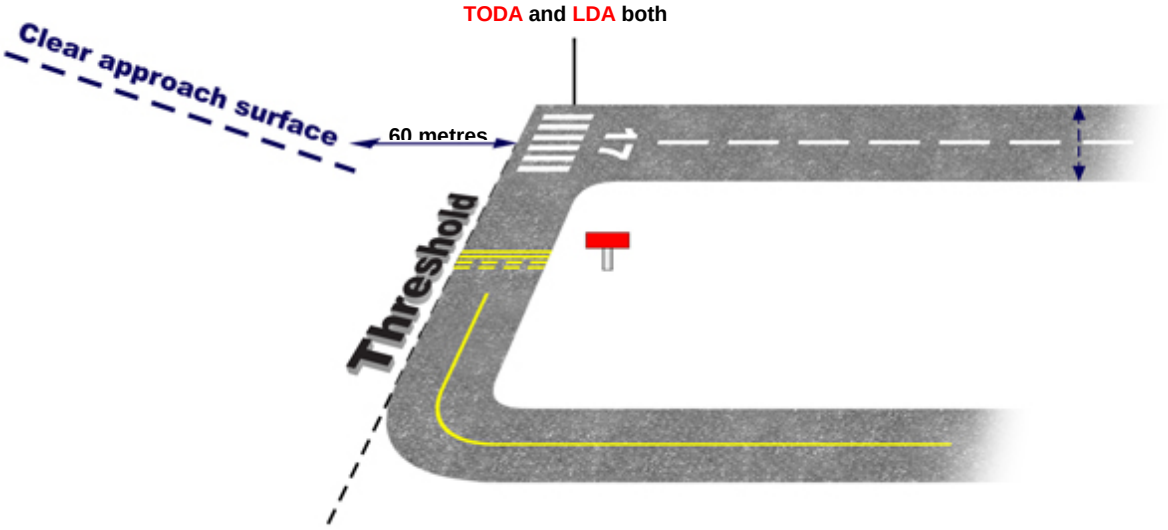
Slope 0.6% down To NW. RWY WID 30 RWS WID 90



Obstacle Free Gradient Required For Take-off at an ALA for Private, Air-work and Charter operations will be:

- BY day 5% (or 1:20)
- NIGHT 3.3% (or 1:30)

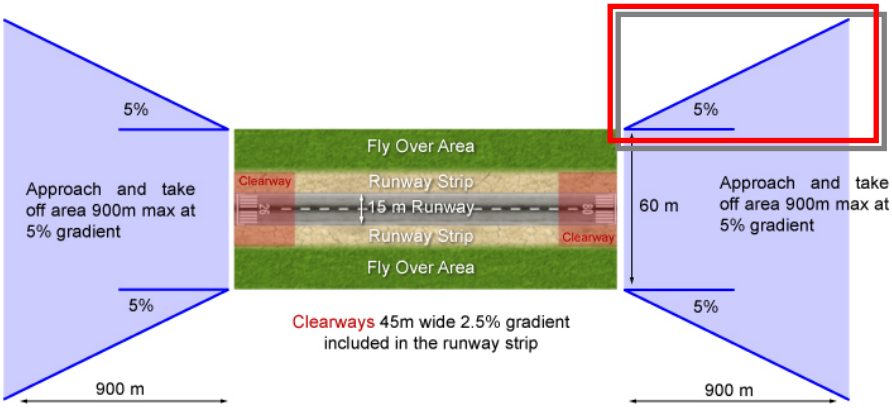
Obstacle Free Gradient for Landing at a licensed field by comparison with the ALA is as follows:



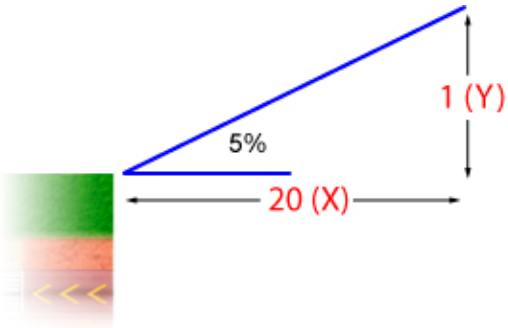
For all aircraft the minimum descent gradient will be 3.3%, measured from a point 60 m before the landing threshold.

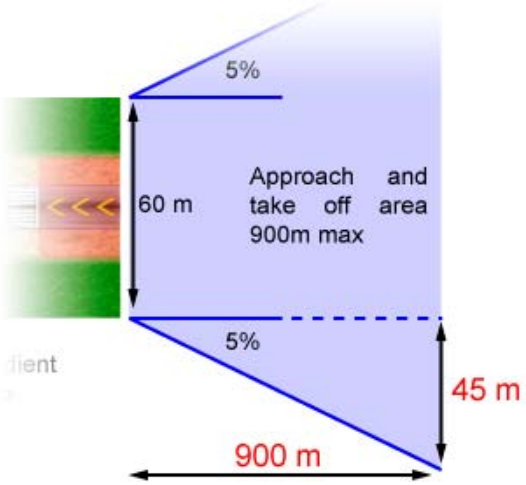
DEMONSTRATION PROBLEMS FOR ALAS

First one needs to look at the HORIZONTAL splay of 5% from the outer edge of the fly over area:



The 5% is a ratio based around a percentage (100 ÷5 = 20) therefore your ratio is 1 in 20 This means that for every 20 units along “X” you would travel 1 unit along “Y”.

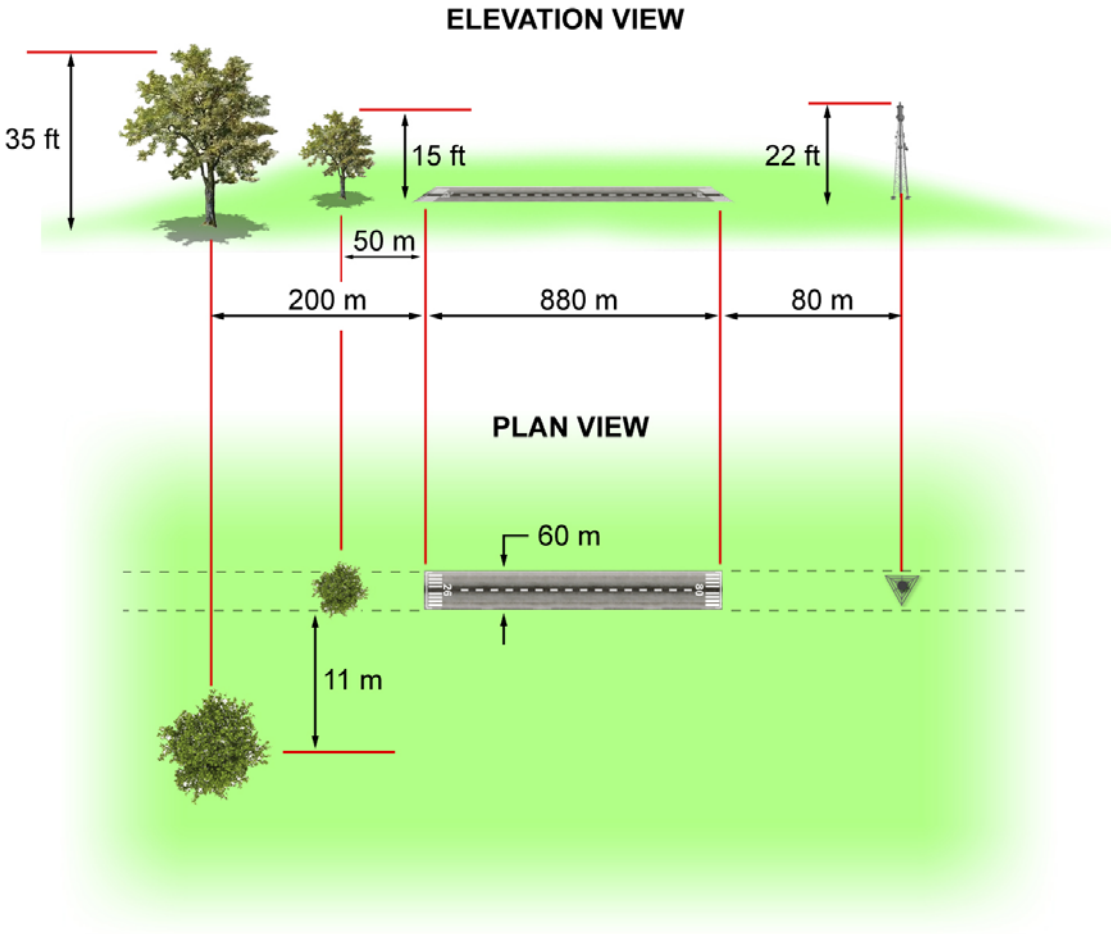




The width of the splay at its maximum of 900m would be found by applying the following using the 1 in 20 ratio, 900m ÷ 20 = 45m.

It is interesting to note that the horizontal splay both for day and night is 5% (1 in 20), measured from the outer edge of the flyover area. The only change horizontally is the overall width of the runway, 60 meters by Day and 90 meters by Night. This in turn changes the area of consideration for obstacles.

Now consider the sketch below and look at the first question regarding the tree at 35ft tall at 200m off the end of the runway.



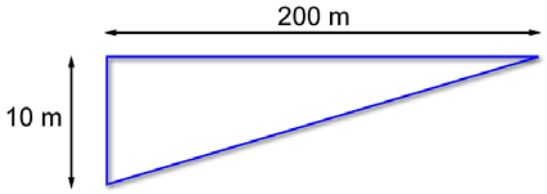
The 35 ft tree at 200 m is an obstacle.

Let us see if we need to consider the tree for day operations:

Is the tree in the splay?

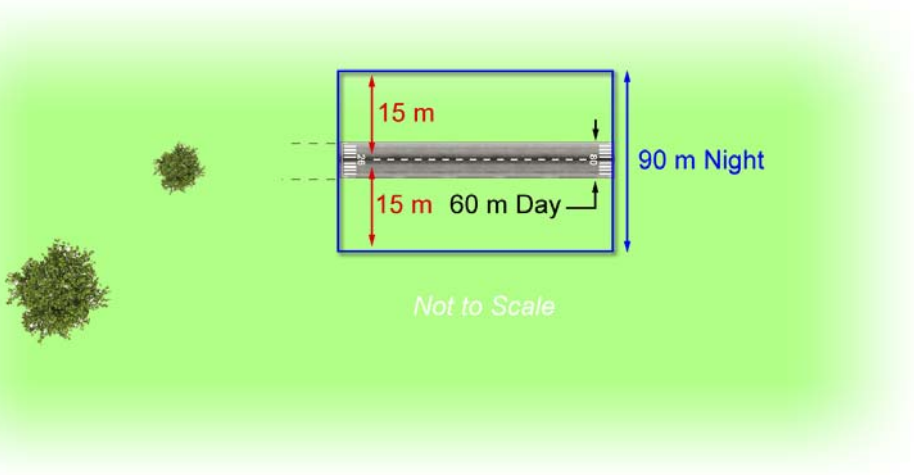
200m ÷ 20 (1 in 20 ratio) = 10m

The width of the splay at 200m is 10m



The sketch also shows the tree is 11m from the outer edge of the fly over area by Day, so it is 1m outside the splay, thus it need not be considered for day operations.

Now let's look at the tree for night operations, this asks that we consider a greater width for the overall runway by night, "90m". If we consider the runway centre line as a datum we can see that the outer edge of the flyover area would move out an extra 15m either side of the runway centre line (60+(15x2)=90).

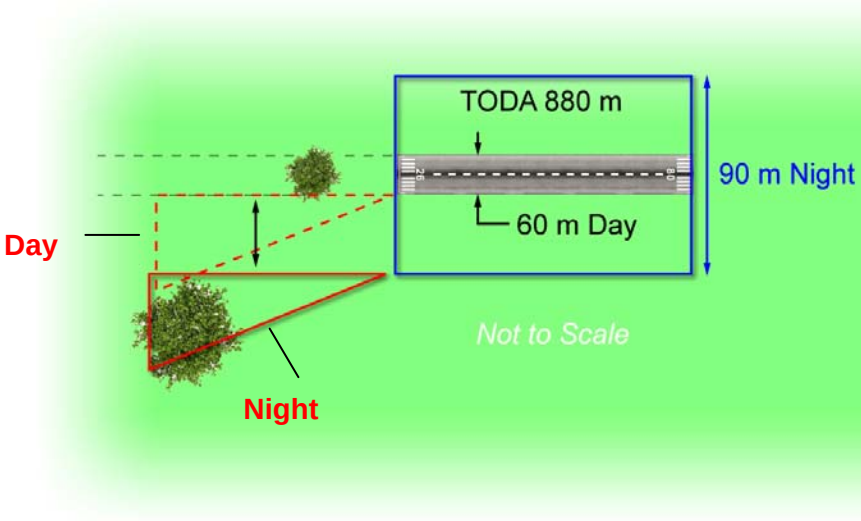


The Tree is still in the same place unless you know someone with a chainsaw. We will assume for the purpose of this exercise that you don't. This means that the tree is 14m inside the obstacle consideration area.

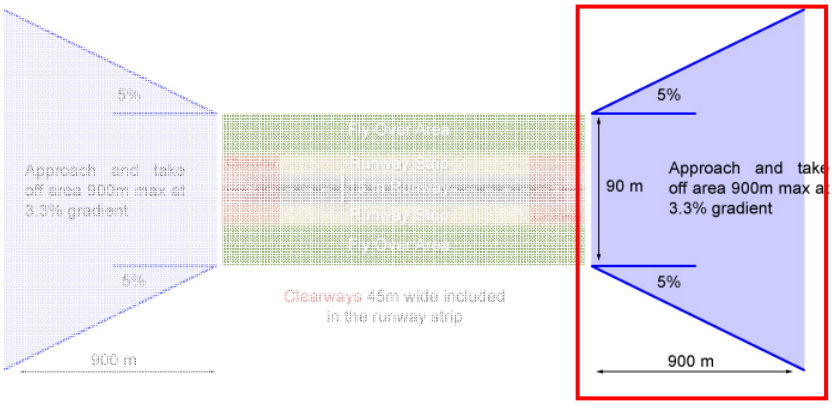
Now that look the tree horizontally splay for day and night, we need to consider the affect it will have on our TODA.

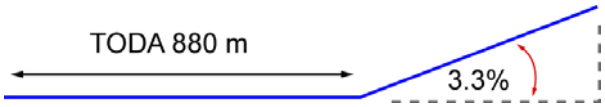
Day: The tree is outside the splay, so there is no effect on the TODA, it will remain at 880m

Night: The Tree is in the area of consideration horizontally, this means that we need to consider the height of the tree and its effect on the TODA.

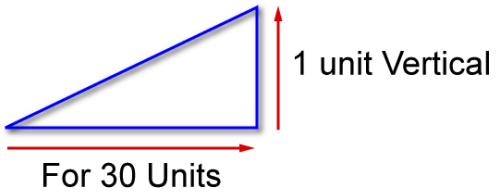


Let us look again at the ALA dimensions for night operations more importantly the APPROACH AND TAKE OFF gradient of 3.3%. This relates to an obstacle free gradient in the vertical

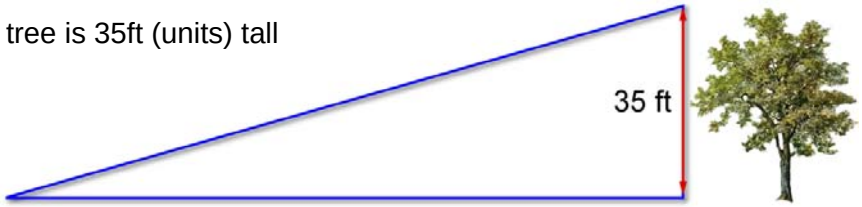




The 3.3% is a ratio based around a percentage. Therefore (100 ÷ 3.3 = 30). This tell us that our ratio is now 1 in 30.



The tree is 35ft (units) tall



Using the 1:20 ratio then an aircraft would have to be at 50 ft:

35 x 20 ÷ 3.28 = 220 m from the tree

Therefore taking off in that direction would shorten the TODA by:

(880 + 200) - 320 m

That is **760 m**

CONVERSION
meter x 3.28 = feet
feet / 3.28 = meters

Find the recommended runway length for the ALA described below for both day and night operation :

- The 15 ft.tree at 50 m is also an obstacle. Using the 1:20 ratio then an aircraft would have to be at 50 ft.:

  15 x 20 ÷ 3.28 = 91 m from the tree

  Therefore taking off in that direction would shorten the TODA by:

  880 + 50 – 91

  That is **839 m.**

- The 22 ft. tower at 80 m is an obstacle. Using the 1:20 ratio then an aircraft would have to be at 50 ft.:

  22 x 20 ÷ 3.28 = 134.m from the tower

Therefore taking off in that direction would shorten the TODA by:

880 + 80 – 134

That is **826 m.**

TODA in the direction of the trees is reduced to 839 m.

TODA in the direction of the tower is reduced to 826 m.

LDA over the 15 ft tree (at 3.3%) is:

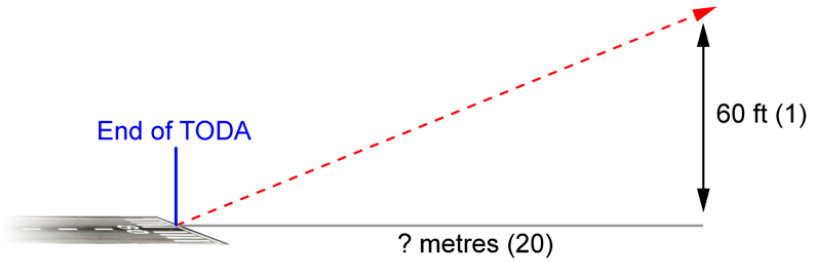
880 +50 – (15 x 30 ÷ 3.28) = 793 m

LDA over the tower (at 3.3%) is:

880 +80 – (22 x 30 ÷ 3.28) = 759 m.

For day operations, what is the minimum recommended distance from the end of the runway length at an ALA for an obstacle 60 feet high? (Answer in metres.)

The climb gradient required is 5% or 1:20 for daylight operations

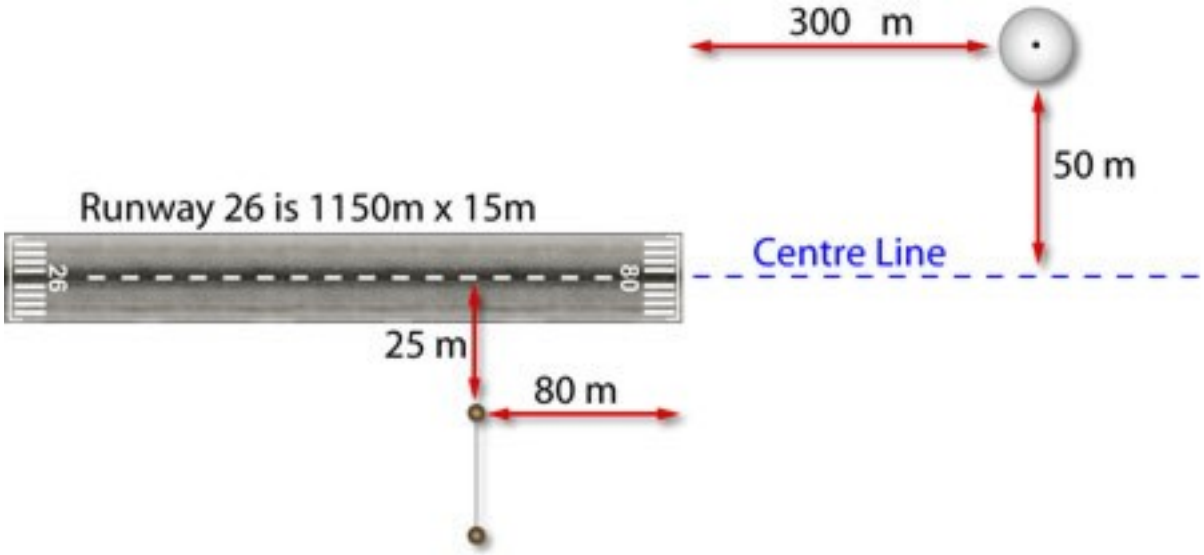


Using the ratio 1:20

Then to achieve a 5% climb a 60 ft obstacle is:

60 x 20 ÷ 3.28 = 366 metres

Calculate the recommended runway 26 length available at this ALA for night operations.



Determine whether or not the water tower is within the splay of 5% by using a 1:20 ratio.

Recall that for night operations the ALA the splay area is measured from the flyover edges, 45m from the centre line. At 50 m the water tower must be within the area.

At 3.3% climb gradient (1:30 ratio) the aircraft must be at 50 ft 22 x 30 m from the tower.

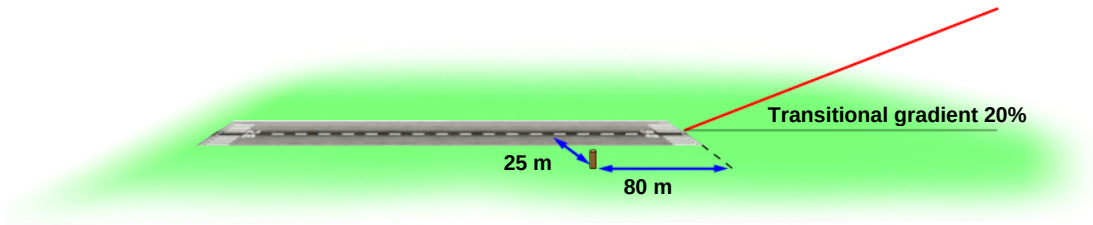
Therefore the runway is reduced to :

1150 + 300 – 660 = 790m

Determine whether or not the post is within the transitional gradient of 20% (1:5 ratio)

Recall that the transitional gradient begins at the edge of the runway strip, which is 60m wide for day and 90m for night operations. The post is located at 25 m from the centre line and is therefore on the RWS 80 m from the end. At 1.5 m high the post reduces the TODA by a further 80m + 30 m to 1040m by day.

Transitional is therefore not a consideration



It now means that a 3.3% climb gradient check must be made from that position.

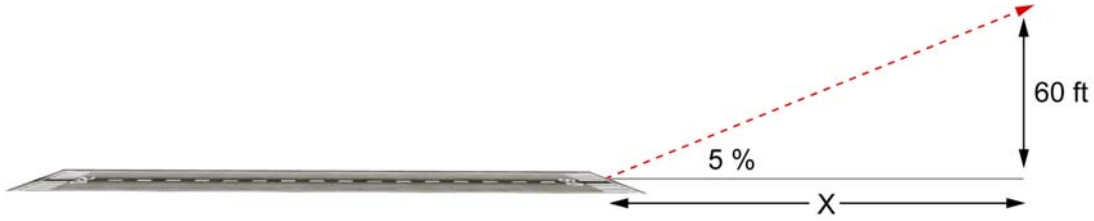
1.5m x 30 = 45m and so the runway must be reduced by a further 15 m to 1025m.

The tower has already limited the runway to 790 m and so the post is irrelevant.

Examples

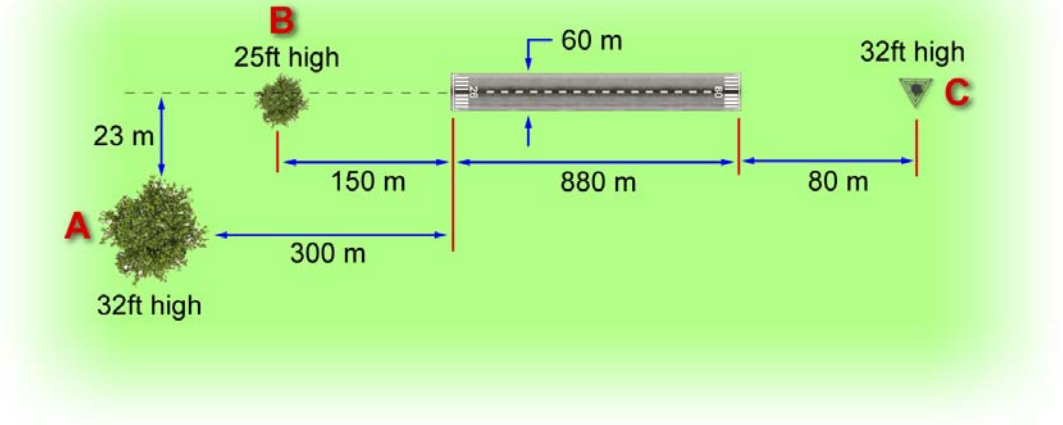
Check the working and conclusions in these examples:

- Find distance *x*.



'End of strip gradient' **= 5% = 20 x 100 = 1200 ft = <u>366 m</u>**

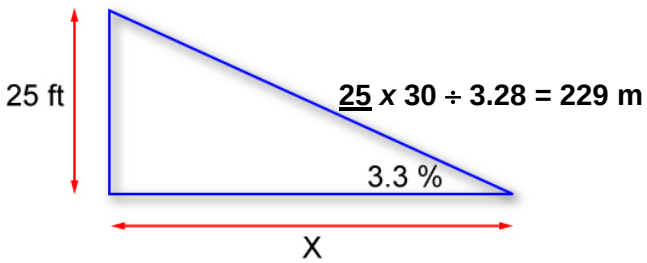
- Find useable strip length if landing and then taking off towards the East.
-



Obstacle B

Need 3.3% obstacle free gradient to land at night.

Find distance from obstacle B to threshold.

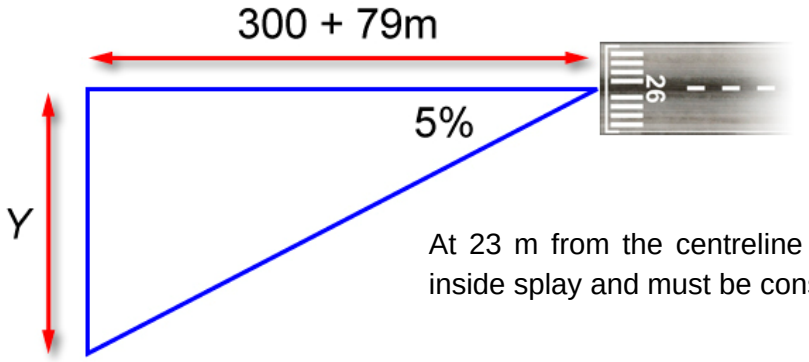


Threshold must be moved **229 - 150 = 79 m** to the EAST

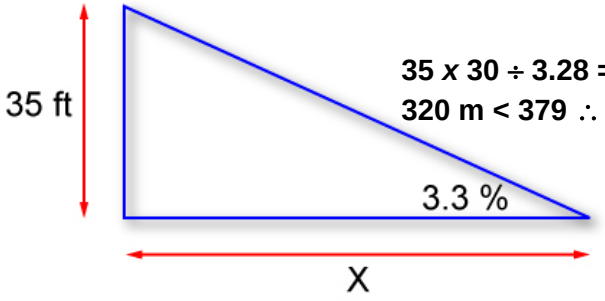
This makes the LDA **880 - 79 = 801m**

Obstacle A

Calculate width of splay over 300 + 79 m



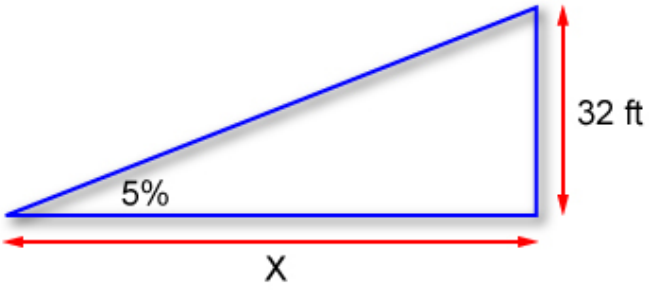
At 23 m from the centreline obstacle A is inside splay and must be considered.



35 *x* 30 ÷ 3.28 = 320 m
320 m < 379 ∴ no problem from A.

Obstacle C

Need 5% obstacle free gradient on take-off by day and 3.3% by night.



C is 180 m from end of strip and so the strip must be shortened by 15m or 113m.

Therefore **TODA = 880 – 15 = 865 m** or **880 – 113 = 767m**