

AIRCRAFT CHARACTERISTICS AFFECTING AIRPORT DESIGN

Topics Covered : Aircraft Characteristics affecting Airport Design and Airport Planning and Layout

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Aircraft characteristics

- ❑ **These are importance to the airport planner and designer.**
- ❑ **Type of propulsion**
- ❑ **Size of aircraft**
- ❑ **Min turning radius**

- ❑ **Min circling radius**
- ❑ **Speed of aircraft**
- ❑ **Aircraft weight and wheel configuration**
- ❑ **Jet blast**
- ❑ **Fuel spillage**
- ❑ **Noise.**

Type of propulsion

<u>Engine</u>	<u>Speed limit kmph</u>
Piston	250 to 750
Ram jet	1280 to 2400
Rocket	4600

Size of Aircraft

Size of Aircraft involves

Wing span

Fuselage length

Height

Distance between main gears

Wheel base

Trail width

Cont.

- ❑ **Wing span decides**
- ❑ **Width of taxi way**
- ❑ **Clearance between two parallel traffic ways**
- ❑ **Size of apron and hanger**
- ❑ **Width of hanger gate**

Cont.

- ❑ **Length of aircraft decides**
- ❑ **Widening of taxi way on curves**
- ❑ **Sizes of apron and hanger**
- ❑ **Height of aircraft or empennage height**
- ❑ **It decides the height of hanger gate**
- ❑ **The gear tread and wheel base**
- ❑ **Min turning radius of the aircraft.**

Min turning radius

? Min turning radius

A line is drawn through the axis of nose gear when it is at its max angle of rotation.

Theoretically max angle of rotation is 90°

It will causes the skidding

Because it is producing excessive wear.

Max angle of nose gear limited 50° to 60° for turbo jet.

Min circling radius

- ❓ **Min radius required in space depends**
 - ❓ **Type of aircraft**
 - ❓ **Traffic volume**
 - ❓ **Weather conditions**
 - ❓ **The diff radii for diff types of aircraft**
 - ❓ **Small gear aviation aircraft under UFR condition
=1.6 Km**

? Bigger aircraft, say two piston engine under VFR condition =3.2 Km

? Piston engine aircraft under IFR =13 Km

? Jet engine aircraft under IFR =80 Km

Speed of Aircraft

It is split into two ways

Cruising speed or ground speed: It is the speed of air craft with respect to the ground when the aircraft flying in air at its max speed.

Air speed: It is the speed of aircraft relative to the wind.

Weight of Aircraft & wheel configuration

- ❓ **Wt of Aircraft directly influence the length of runway and structural requirements, i.e. the thickness of runway, taxiway, apron and hangers.**

Jet blast

- ❑ **High velocity Aircraft it will eject the hot exhaust gases.**
- ❑ **The velocity of jet blast may be high as 300kmph**
- ❑ **Due to this passenger may feel inconvenience.**
- ❑ **To avoid this problems several jet blast deflectors are available.**

Fuel spillage

- ❓ **It is very diff to avoid the fuel spillages at loading aprons and hanger.**
- ❓ **Bitumen pavement are affected by the fuel spillage.**
- ❓ **But it should bring within min limit.**
- ❓ **So that constant supervision is required at fuel inlets, engines and main landing gear.**

Noise

- ❑ **Noise generated by Aircraft create problem.**
- ❑ **Layout and capacity depend on it.**
- ❑ **It should be min as per as possible.**
- ❑ **It is regulated by FAA (Federation Aviation Agency).**



AIRPORT PLANNING AND LAYOUT

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AIRPORT SITE SELECTION

Factors for selection of a suitable site:

- Regional plan
- Airport use
- Proximity to other airports
- Ground accessibility
- Topography
- Obstructions
- visibility

Cont.

- ❑ **Wind**
- ❑ **Noise nuisance**
- ❑ **Grading, drainage and soil characteristics**
- ❑ **Future development**
- ❑ **Availability of utilities from town**
- ❑ **Economic considerations**

Regional plan

❓ The site should fit for regional plan

❓ Forming it an integral part of the national network of airport.

Airport use

- ❑ **Selection is depend on type use whether for civilian or for military operations.**
- ❑ **In emergency civilian airports also used for military purpose.**

Proximity to other airports

- ❓ **The site should be considerable from the exiting airports.**
- ❓ **So that landing in one airport does not interfere with the other airport.**
- ❓ **Min spacing have been suggested:**
- ❓ **For airports serving small aviation aircraft under VFR condition =3.2 Km**

- ? For aircraft serving bigger aircraft, say two piston engine under VFR condition =6.4 Km**
- ? For aircraft operating piston engine aircraft under IFR =25.6 Km**
- ? For aircraft operating Jet engine aircraft under IFR =160 Km**

Ground accessibility

- ❑ **Site should be selected that it is readily accessible to the users.**
- ❑ **Passenger time is more concerned rather than the actual time in air travel.**
- ❑ **The time required to reach an airport not exceeds 30 minutes.**
- ❑ **It should be located adjacent to the main highway.**

Topography

- ❑ **It includes like ground contours, trees, streams.**
- ❑ **A raised ground usually considered for airport.**
- ❑ **Reasons:**
 - ❑ **Less obstructions in approach zones**
 - ❑ **Natural drainage**
 - ❑ **More uniform wind**
 - ❑ **Better visibility.**

obstructions

- ❓ **For landing or take off, long clearance areas are provided on either side of runway known as approach areas.**
- ❓ **These structures are controlled by zoning laws.**

visibility

- ❑ **The site should be free from visibility reducing conditions like fog, smoke.**

wind

- ❑ **Runway is oriented by wind data.**
- ❑ **Wind data i.e. direction, duration and intensity collected over a min 5 yrs.**

Noise nuisance

- ❓ **Noise depends on type of propulsion and gross wtof aircraft.**
- ❓ **The problem is more with jet engine.**
- ❓ **So that area should away from residential and industrial area.**

Grading, drainage and soil characteristics

- ▣ **Grading and drainage play an important role in the construction and maintenance of airport.**
- ▣ **Previous materials i.e. gravel, sand soils are suitable for aircraft construction.**

Future development

- ❑ **Air traffic volume will continue to increase in future,**
- ❑ **More no. of runways provided.**
- ❑ **More no. of facilities for processing of passengers, baggage and cargo.**
- ❑ **Zoning laws implemented to prevent growth of undesirable structures with in the area.**

Availability of utilities from town

- ❑ **Airport has to be provided with facilities like :**
- ❑ **water supply**
- ❑ **Sewer**
- ❑ **Telephone**
- ❑ **electricity**

Economic considerations

- ?** The estimate should be prepared for various site that includes land cost, clearing and grading of land, drainage, removal of hazards, paving, turfing, lighting, construction of buildings, access roads and automobile parking areas.
- ?** Select from one of from above which is economical for us.

Hanger

- ❑ **The primary function of hanger is to provide an enclosure for servicing,**
- ❑ **overhauling and**
- ❑ **doing repairs of the aircrafts.**

Suitable site for hanger

- ❑ **It should convenient road access from site to apron, and terminal building.**
- ❑ **Proximity to and easy installation of utilities e.g. electricity, telephone, water supply and sewers etc.**
- ❑ **Reasonable proximity to the loading apron.**
- ❑ **Sufficient car area to provide car parking**
- ❑ **Favorable topography providing good natural drainage.**
- ❑ **Adequate site area for future expansion.**

apron

- ❓ **It is paved area for parking of aircraft,**
- ❓ **Loading and unloading of passengers and cargo.**
- ❓ **Usually located near to the terminal building or hanger.**

Cont.

- ❑ **Size of apron depends upon:**
- ❑ **Size of loading area required for each type of aircraft. This area is also known as gate position.**
- ❑ **No. of gate positions**
- ❑ **Aircraft parking system.**