CHAPTER III

BASIC THEORY

3.1 Airport Specification

For the purpose of stipulating geometric design standards for the various types of airports and the functions which they serve, letter and numerical codes and other descriptors have been adopted to classify airports. The airport reference code is a coding system used to relate the airport design criteria to the operational and physical characteristics of the aircraft intended to operate at the airport. It is based upon the aircraft approach category and the airplane design group to which the aircraft is assigned.

3.1.1 Aircraft Approach Category

Its designated by a latter, this component describes the operational characteristic of the aircraft approach speed.

Table 3.1 Aircraft Approach Categories

Category	Approach Speed (Kn)
A	< 91
B	91 - 120
C	121 - 140
D	141 - 166
E	166

Source: *Horonjeff et al, 2010*

3.2.1 Airplane Design Group

Designated by number, this is the second component relates to the physical characteristic of airplane wingspan.

Table 3.2 Airplane Design Groups

Group Number	Tail Height (ft)	Wingspan (ft)
I	< 20	< 49
II	20 - < 30	49 - < 79
III	30 - < 45	79 - < 118
IV	45 - < 60	118 - < 171
V	60 - < 66	171 - < 214
VI	66 - < 80	214- < 262

Source: *Horonjeff et al, 2010*

3.2 Runway Length Standard

Other than orientation, planning and designing the length of a runway is critical to whether or not a particular aircraft can safely use the runway for takeoff or landing. The influential factors for estimating the runway length is based on their maximum takeoff weights (MTOW), certain aircraft performance specifications, and the airports field elevation and temperature.

FAA (Federal Aviation Administration) has provided guidance codes for airport planner. The codes are Advisory Circular 150/5325-4b, Runway Length Requirements for Airport Design. FAA groups aircraft by MGTOW (Maximum Takeoff Weights)

and the result is separated by two conditions to estimating runway length requirements. Requirements such as:

3.2.1 Aircraft Less than 12,500 lb MGTOW

Critical aircraft less than or equal to 12,500 lb MGTOW are considered “small airplanes” for the purposes of estimating runway length requirements. The calculation of runway length requirements can be use the graph that shown on the Figure 3.2.

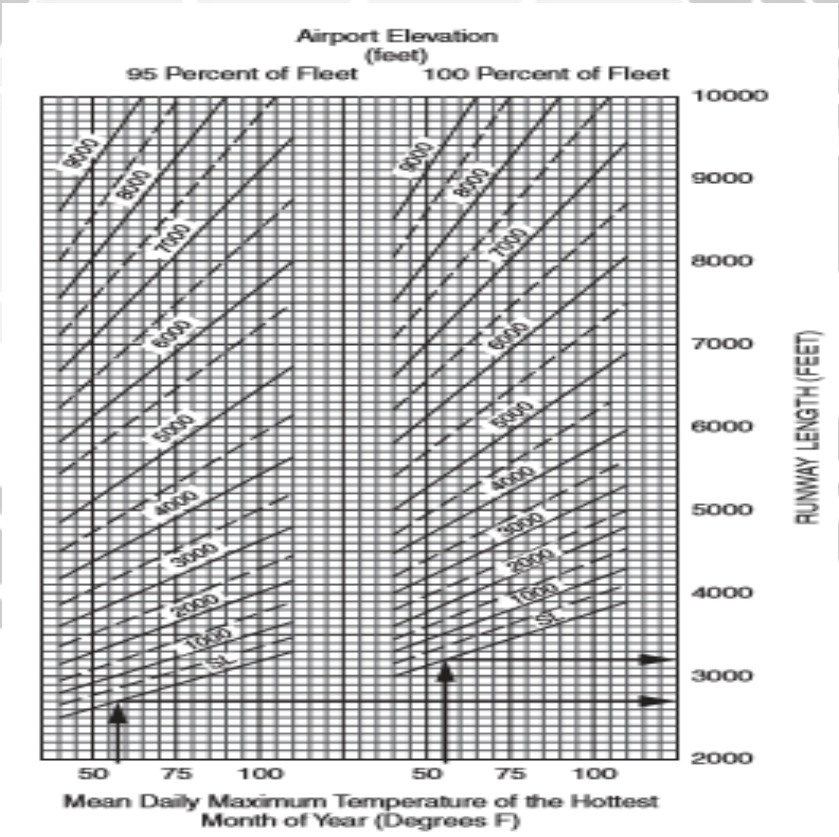

Figure 3.1 Small Airplanes Runway Length Requirements Graph

Source: *Federal Aviation Administration, 2014*

3.2.2 Aircraft Greater than 60,000 lb MGTOW

For aircraft greater than 60,000 lb MGTOW, runway lengths are estimated based on the specific performance specifications of the critical aircraft. To determine the aircraft's required runway lengths for both takeoff and landing, based on the aircraft's operating configuration, its estimated weights during takeoff and landing, as well as the airport elevation and average high temperature during the hottest month.

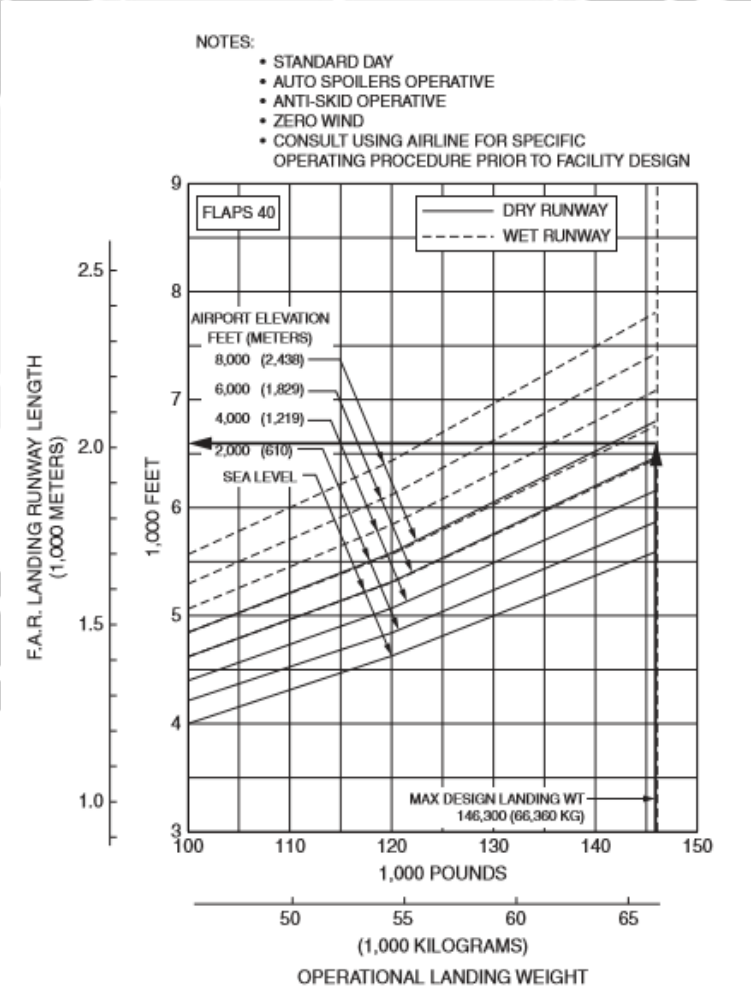

Figure 3.2 Landing Runway Length Graph

Source: *Federal Aviation Administration, 2014*

3.2.3 Runway Correction Factors

After determining the runway length using MTOW chat then, next is to make correction to the result in order to get the actual runway length needed. The formula will show below:

a. The correction factor for elevation (Fe)

$$Fe = 1 + 0.07\ x\ (\frac{h}{300}) \quad \textbf{Eq.}\ 1$$

Desc: Fe = The correction for elevation

h = runway elevation

b. The correction factor for temperature (Ft)

$$Ft = \ 1 + 0.01\ x\ [\ T - (15 - 0.0065\ x\ h\ )] \quad \textbf{Eq.}\ 2$$

Desc: Ft = The correction factor for temperature

h = runway elevation

T = average temperature above sea level

c. The correction factor for runway slope (Fs)

$$Fs = 1 + 0.1\ x\ G \quad \textbf{Eq.}\ 3$$

Desc: Fs = The correction factor for runway slope

G = runway slope

3.3 Taxiway Separation Distance

The separations are currently based on the premise that any part of the aircraft on the taxiway center line must not protrude into the associated runway strip area. This distance, S, is represented by the relationship:

$$S = \frac{1}{2}(SW + WS) \quad \textbf{Eq.}\ 4$$

Desc: SW = strip width

WS = wings span

3.4 Apron Area Requirement

The apron area calculation consists of the width, length and apron capacity. The apron length can use the following formula:

$$Apron\ Lenght = \sum_i Ni\ x\ Si + (N - 1)x\ C \quad \textbf{Eq.}\ 5$$

Desc: N = Total Parking Stand

Ni = Total Parking Stand for Aircraft type i

Si = Wing Span for Aircraft type I (m)

C = Clearance (m)

To calculate the width of the apron can be use the following formula:

$$Apron\ Width = \mathrm{P} + \mathrm{B} + \mathrm{C} \qquad \textbf{Eq.}\ 6$$

Desc: P = Aircraft Length (m)

B = Distance from taxiway centerline (m)

C = Clearance (m)