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INTERNATIONAL CIVIL AVIATION ORGANIZATION

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RUNWAY CAPACITY ASSESSMENT METHODOLOGY

FAA MODEL

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By ATM SECTION ICAO WACAF

OUTLINE

- INTRODUCTION
- MODEL ASSUMPTIONS
- MODEL COMPONENTS AND OUTPUT
- STEPS OF THE METHODOLOGY

INTRODUCTION

Airport operations efficiency requires knowledge of the capacity of each airport components:

- Landside capacity
- Terminal capacity
- Airside capacity including
  - ✓ Runway capacity
  - ✓ Taxiway capacity
  - ✓ Apron capacity

INTRODUCTION

CONTEXT

- Airport capacity determination requires the use of a selected suitable methodology.

- Several methodologies for determining airport capacity exist worldwide. However, there is no regionally agreed such methodologies for the AFI region.

- The FAA has developed a methodology which is adopted in several regions including South America.
- The review of the various methodologies will provide a range of options for AFI States in selecting and adapting the most suitable methodologies.

INTRODUCTION

DEFINITIONS

- ✓ **AIRPORT CAPACITY:** the total number of movements that an airport can handle during a given period of time.
- ✓ **Airport Acceptance Rate (AAR):** A dynamic parameter specifying the number of arrival aircraft that an airport, in conjunction with terminal airspace, ramp space, parking space and terminal facilities, can accept under specific conditions during any consecutive 60-minute period.
- ✓ **Airport component:** airport infrastructure at the airside including runway, taxiway and apron.
- ✓ **Airport hourly capacity:** The number of aircraft that an aerodrome can accept per hour--also taking into account weather, terminal airspace, apron space, parking space and facilities.
- ✓ **AIRCRAFT MIX:** Percentage of each category of aircraft utilizing the runway.
- ✓ **MIX INDEX: is percent of arrivals Category C added to three times the percent of arrival Category D [%(C+3D)]**
- ✓ **GATE MIX:** the percentage of non-widebodied aircraft using each gate group (Light and Medium).
- ✓ **GATE GROUP:** A group of gates dedicated to specific air operators at an airport.

ASSUMPTION OF THE MODEL

❑ FACTOR TO CONSIDER

a) Weather conditions: VMC and IMC have impact on airport capacity ;

b) Arrival percent: Arrivals equal departures;

c) Percent of touch and go is between 0% and 50%; and

d) Taxiway: full-length parallel taxiway, ample runway entrance/exit taxiways, and no taxiway crossing problems.

e) There are no airspace limitations which would adversely impact flight operations

f) Missed approach protection is assured for all converging operations in IFR weather conditions.

g) The airport has at least one runway equipped with an ILS and has the necessary ATC facilities and services to carry out operations in a radar environment.

ASSUMPTION OF THE MODEL

❑ FACTORS TO CONSIDER

✓ **FACTORS RELATED TO LANDING AND TAKE-OFF OPERATIONS:**

a) Airport acceptance rate;

b) Aircraft mix;

c) Mix index;

d) Runway hourly capacity base;

e) The exit factor

f) Taxiway hourly capacity base;

g) Gate group hourly capacity base;

h) The gate mix and gate occupancy time

i) The airport component demand ratio.

MODEL COMPONENTS AND OUTPUT

✓ **MODEL OUTPUT:** the airport hourly capacity (AHC) is the minimum of the airport component quotient.

$$(1) \quad AHC = \mathbf{Min}\ (Q_{RWY}, Q_{TWY}, Q_{GATE})$$

$$Q_{RWY} = \frac{RHC}{RDR} \qquad Q_{TWY} = \frac{THC}{TDR} \qquad Q_{GATE} = \frac{GHC}{GDR}$$

RHC: Runway Hourly Capacity RDR: Runway Demand Ratio

THC: Taxiway Hourly Capacity TDR: Taxiway Demand Ratio

GHC: Gate Hourly Capacity GDR: Gate Demand Ratio

MODEL COMPONENTS AND OUTPUT

❑ CALCULATING THE hourly capacity of Runway (HCR)

HCR=C x E x T

elements to calculate

1. The Percent of arrivals per hour
2. The mix index: %(C+3D)
3. The runway hourly capacity base (C): The base value for runway physical capacity per hour under ideal operational circumstances. C=f(Mix index, percent of arrival), to read on the appropriate catalogue designed by simulation.
4. The exit factor (E): Depends on the number of taxiways (N) and the location from the departure end of runway. When N=4, E=1.
5. The Touch & Go factor (T): Depends on the percent of touch & go and the mix index. T value to be read on the appropriate catalogue designed by simulation. In IMC T=1 since there is no T&G (VFR training)

MODEL COMPONENTS AND OUTPUT

❑ CALCULATING THE hourly capacity of Runway (HCR)

HCR=C x E x T

Catalogue for the

Determination of parameters

C, T and E

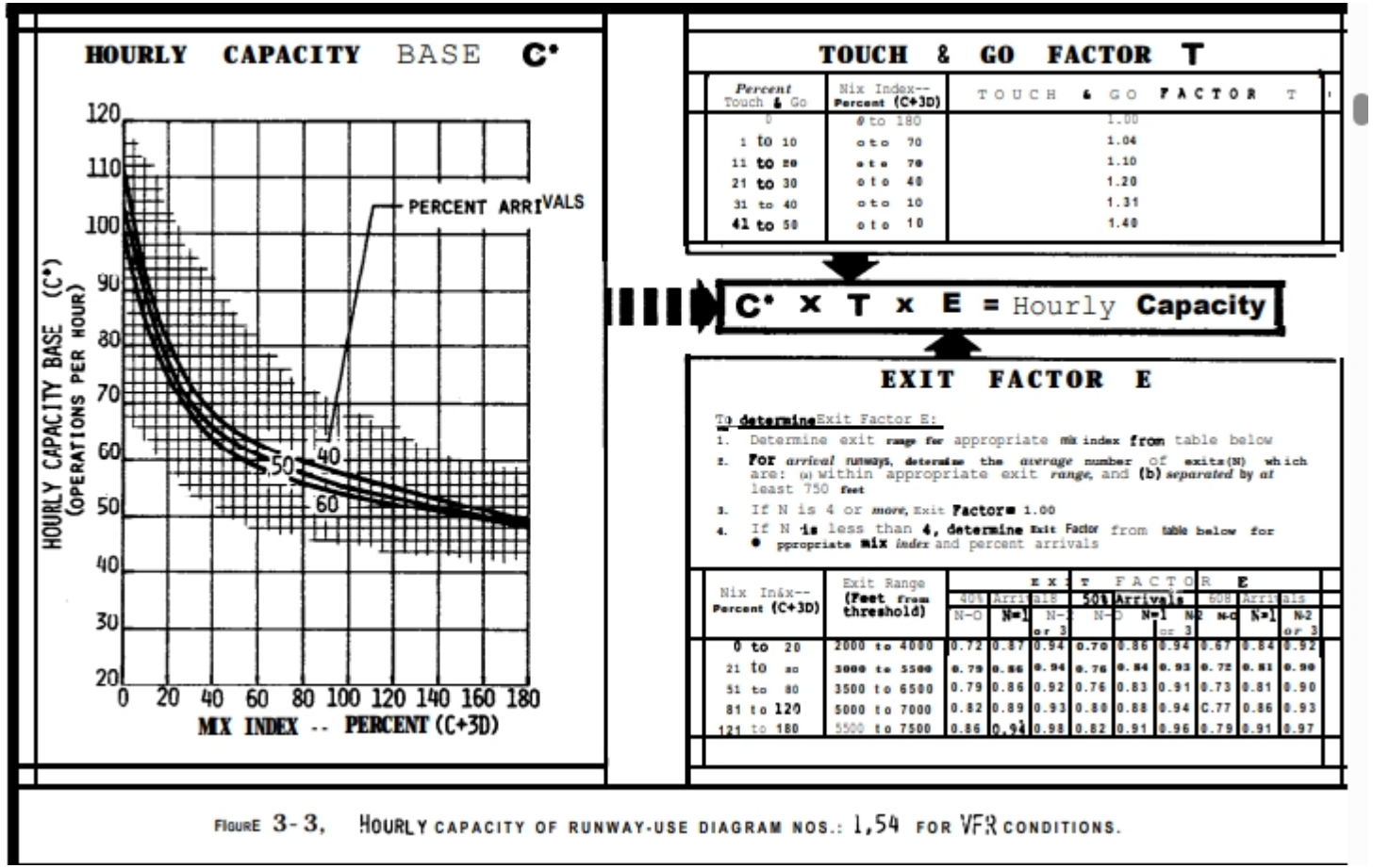


FIGURE 3-3. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NOS.: 1,54 FOR VFR CONDITIONS.

MODEL COMPONENTS AND OUTPUT

❑ CALCULATING The hourly capacity of Taxiway (HCT)

elements to calculate

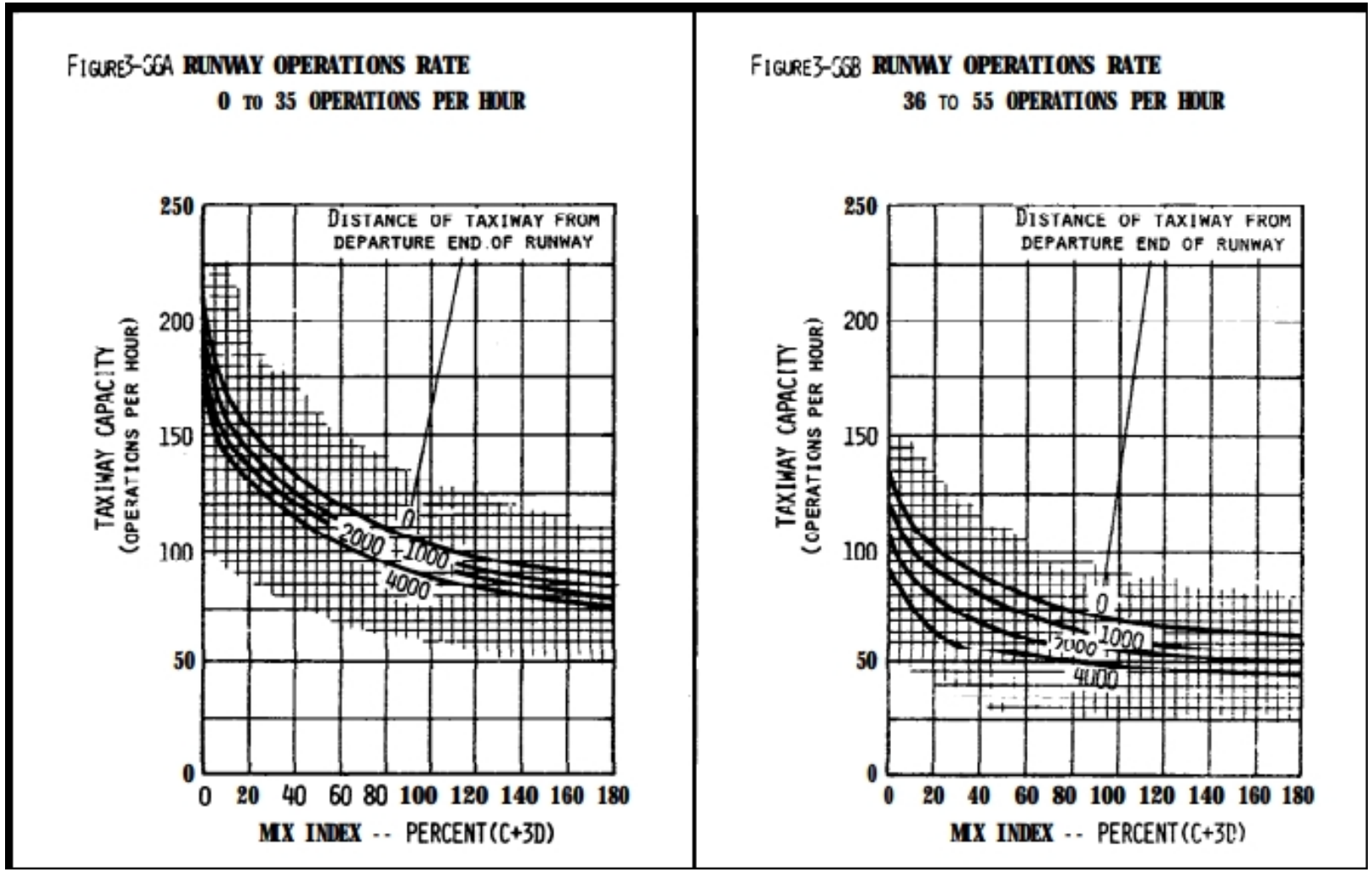
1. The Airport Acceptance Rate (AAR)
2. The mix index: %(C+3D)
3. The distance of the taxiway from the departure end of runway.
4. HCT value to be read on the appropriate catalogue designed by simulation.

MODEL COMPONENTS AND OUTPUT

❑ CALCULATING The hourly capacity of Taxiway (HCT)

Catalogue for determining

HCT



MODEL COMPONENTS AND OUTPUT

❑ CALCULATING The hourly capacity of Gate group (HCG)

HCG= G x S x N

elements to calculate

1. The hourly gate capacity base (G): which depends on the percent of non-widebody aircraft using the gate (the gate mix), the non-widebody aircraft gate occupancy time and the gate occupancy time ratio (R). G value to be read on the appropriate catalogue designed by simulation.
2. The gate size factor (S): Parameter to be read on catalogue
3. The number of gates in the gate group (N).

NOTES:

(1) $R = \dfrac{\text{AVERAGE GATE OCCUPANCY TIME FOR WIDEBODY AIRCRAFT}}{\text{AVERAGE GATE OCCUPANCY TIME FOR NON-WIDEBODY AIRCRAFT}}$

(2) IF OPERATIONS DO NOT INCLUDE WIDEBODY AIRCRAFT, GATE MIX = 100 AND R = 1.0

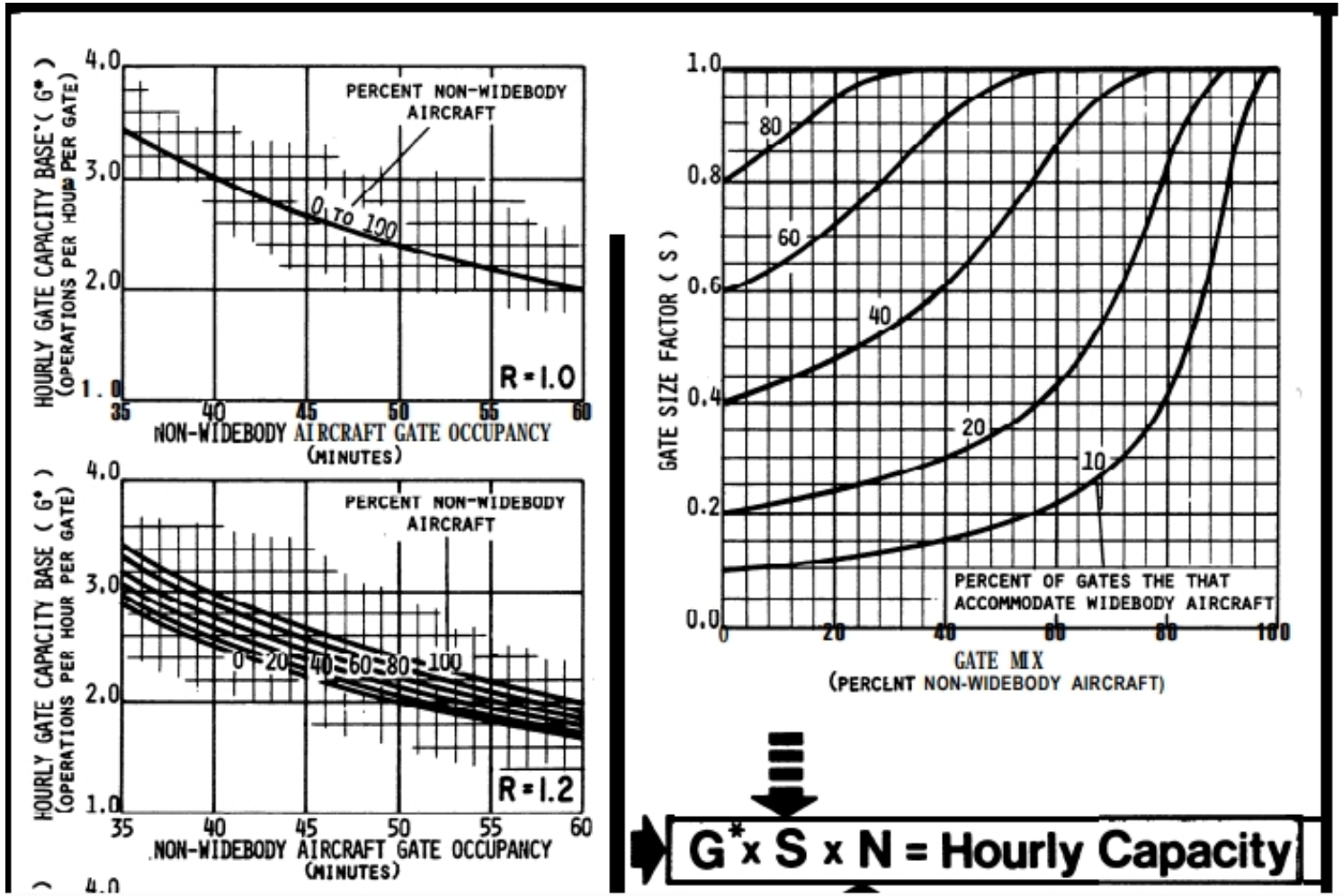
MODEL COMPONENTS AND OUTPUT

❑ CALCULATING The hourly capacity of Gate group (HCG)

HCG= G x S x N

Catalogue for determining

The hourly gate group capacity



MODEL COMPONENTS AND OUTPUT

❑ CALCULATING The airport hourly capacity (AHC)

elements to calculate

1. The hourly capacity of each airport component (Runway, Taxiway, Apron).
2. The airport component hourly demand: which should be based on empirical records of movements on each airport component
3. The demand ratio of each airport component (RDR, TDR, GDR):

$$RDR = \frac{RD}{RD} = 1$$

$$TDR = \frac{TD}{RD}$$

$$GDR = \frac{GD}{RD}$$

4. The airport component quotient:

$$Q_{RWY} = \frac{RHC}{RDR}$$

$$Q_{TWY} = \frac{THC}{TDR}$$

$$Q_{GATE} = \frac{GHC}{GDR}$$

MODEL COMPONENTS AND OUTPUT

❑ CALCULATING The airport hourly capacity (AHC)

elements to calculate

5. The hourly airport capacity as the lowest of the airport component quotient

$AHC=Min(Q_{RWY}, Q_{TWY}, Q_{GATE})$

Thank You!

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