ATS System Capacity Workshop

Hein Reid, SM: O (N) ATNS

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N203JE
G-NABB
N818HK

Most contemporary authors agree that measurement is an activity that involves interaction with a concrete system with the aim of representing aspects of that system in abstract terms

Stanford University

The Big Question

The big question for many African ANSPs today is: What is the capacity of my system?

Associated questions:

- Do I have enough capacity?
- For what?
- *Some days we move many aircraft, other days we don't move half as much. What is going on?*
- *The ATCs are driving me crazy…*

ATS System Capacity - demystified

An example

A bottling production plant made up from:

- Filling of bottles
- Capping of bottles
- Labelling of bottles
- Packaging of bottles

Bottling…

Assuming that the following hourly capacities:

- Filling: 25
- Capping: 30
- Labelling: 30
- Packing: 20

How many units (bottles) can be filled per hour?

… 20

Important insight: a value chain of variables

ATS System Capacity Calculation

… a value chain of variables…

Variables

- Runway capacity
- Approach capacity
- Apron capacity
- Terminal building / passenger processing capacity

ATS System Capacity Calculation

Sources of information

- Work study
- Task / time models
- Simulations
  - Fast time
  - Real time
- Historic values

ATS System Capacity Calculation: Runway Capacity

Runway Capacity → Approach Capacity → Apron Capacity → Terminal Capacity

- The average time required to process 1 flight.
- The number of flights that you can process per hour
- The average runway occupation time.
- Example: 2 min
- Calculation: 60 ÷ 2 = 30 aircraft per hour

ATS System Capacity Calculation: Approach Capacity

Runway Capacity | **Approach Capacity** | Apron Capacity | Terminal Capacity

Prevailing meteorological conditions

- Capacity = the permissible flight rules
- Any combination of traffic mix may present itself:
  - IFR only;
  - Mixed mode:
    - IFR and SVFR;
    - IFR and VFR;
  - VFR only

ATS System Capacity Calculation: Approach Capacity

Runway Capacity | **Approach Capacity** | Apron Capacity | Terminal Capacity

IMC

- Pure Instrument Meteorological Conditions ≠ VFR flights
- Approach capacity = divide 60 minutes by the instrument approach landing interval
- Example: Landing interval 12 minutes:
- Approach capacity = 60 minutes ÷ Landing interval
  = 60 ÷ 12
  = 5 aircraft per hour
- Note: 1 take off for each landing aircraft
- Hourly capacity = 10 aircraft per hour (5 arrivals + 5 take offs)

ATS System Capacity Calculation: Approach Capacity

Runway Capacity | **Approach Capacity** | Apron Capacity | Terminal Capacity

IMC / SVFR mix

- Special VFR flights permitted
- Historic values = average time for 1 SVFR flight in controlled airspace
- Assuming: average of 5 minutes / SVFR flight,
- 12 such SVFR flights can be handled per hour.
- Adding the 10 IFR flights from example above, the runway capacity in mixed mode (IFR and SVFR): 22 aircraft / hour.

ATS System Capacity Calculation: Approach Capacity

VFR flights

- The largest of the possible capacity declarations
- VFR separation minima is lowest of all separation minima

ATS System Capacity Calculation: Apron Capacity

Runway Capacity → Approach Capacity → **Apron Capacity** → Terminal Capacity

Apron capacity

- The airport authority will declare the apron capacity.
- In the absence of such a declaration, historic values should be used.
- Example: "*The most aircraft that we ever had on the apron was 15*."
- Apron capacity = 15

ATS System Capacity Calculation: Terminal Capacity

Terminal capacity

- The airport authority to declare the terminal capacity
- Historic values
- Airport manager engaged
- Terminal capacity: the number of passengers processed by
  - Immigration
  - Customs
  - luggage processing capacity

ATS System Capacity Calculation: Terminal Capacity

Runway Capacity → Approach Capacity → Apron Capacity → **Terminal Capacity**

Terminal capacity

- Terminal building capacity calculated in terms of number of aircraft.
- The average number of seats for aircraft sample operating at the airport,
- Passenger numbers are converted to number of aircraft.
- Example: number of passengers processed per hour
  - Immigration 300
  - Customs 375
  - Luggage 450

ATS System Capacity Calculation: Terminal Capacity

Runway Capacity → Approach Capacity → Apron Capacity → **Terminal Capacity**

Terminal capacity

Example: Attachment A

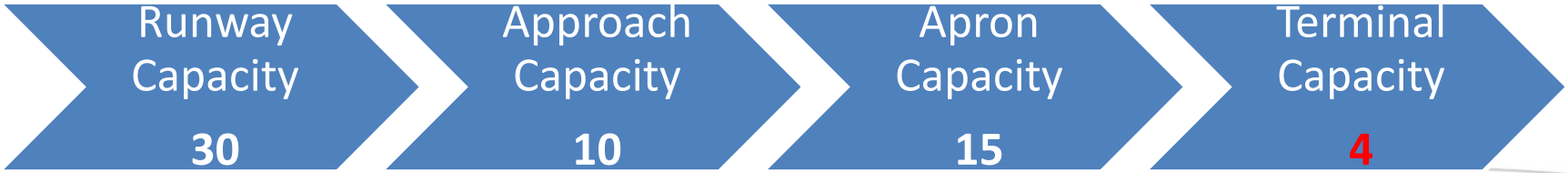
Average number of passengers / plane: assumed 75

	Immigration	Customs	Luggage
Number of persons handled per hour	300	375	450
Average number of passengers per plane	75	75	75
Average number of aircraft per hour	4	5	6

ATS System Capacity Calculation

Capacity variables

- Runway capacity
- Approach capacity
- Apron capacity
- Terminal building / passenger processing capacity



ATS System Capacity Calculation

Runway Capacity > Approach Capacity > Apron Capacity > **Terminal Capacity**

Variable	Component	IMC		VMC	
		IFR Only	IFR / SVFR	IFR / VFR	VFR
Runway		30	30	30	30
Approach		10	22	30	30
Apron		15	15	15	15
Terminal	Immigration	4	4	4	4
	Customs	5	5	5	5
	Luggage	6	6	6	6
Effective capacity		4	4	4	4

ATS System Capacity Application

Runway Capacity → Approach Capacity → Apron Capacity → **Terminal Capacity**

Growth Opportunities: Constraints

Demand / Capacity Management

Exercises…

Contact us

ATNS HEAD OFFICE

Postal address
Private Bag X15
Kempton Park
1620

Street address
Block C, Eastgate Office Park
South Boulevard Road
Bruma
2198
Gauteng
Republic of South Africa

Contact details
Tel: +27 11 607 1000
Fax: +27 11 607 1570
Website: www.atns.com
email: marketing@atns.co.za

THE AVIATION TRAINING ACADEMY

Postal address
Private Bag X1
Bonaero Park
1622

Contact details
Tel: +27 11 570 0400
Fax: +27 11 395 3347