ATS System
Capacity Workshop

Hein Reid, SM: $O(N)$ ATNS
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 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
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
Sources of information

• Work study
• Task / time models
• Simulations
  – Fast time
  – Real time
• Historic values
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: $60 \div 2 = 30$ aircraft per hour
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
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)
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.
VFR flights

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

Example: Attachment A

Average number of passengers / plane: assumed 75

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<td>Average number of aircraft per hour</td>
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ATS System Capacity Calculation

Capacity variables

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

- Runway Capacity: 30
- Approach Capacity: 10
- Apron Capacity: 15
- Terminal Capacity: 4
# ATS System Capacity Calculation

## Runway Capacity

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## Approach Capacity

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## Apron Capacity

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## Terminal Capacity

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## Effective capacity

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Growth Opportunities: Constraints
Demand / Capacity Management

Exercises...
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