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SAM/IG/18-WP/16
10/10/16

Agenda Item 3: Implementation of Air Traffic Flow Management (ATFM)

RUNWAY CAPACITY AND ATFM PLANNING

(Presented by Brazil)

SUMMARY

This working paper aims to present the influence of runway capacity on the ATFM planning, as well as its relation to the capacity percentage which can be applied to a certain system.

References:

- SAM/IG/17 Meeting report (Lima, Peru, 9 to 13 May 2016).

ICAO strategic objectives:	*A – Safety* *B – Air navigation capacity and efficiency*

1. Introduction

1.1 In the process of implementation of ATFM in Brazil, the efficiency of results were always one of the main concerns. These results however should not affect the operational safety standards required. On that perspective, a systemic thinking philosophy was established, i.e., the understanding that each element is a system (airport, ATC, airlines, etc.) and that they are part of a greater system (SISCEAB-Airspace Control System). Thus, knowing the capability of a system (capacity x demand) is essential in order to plan the operations so as to meet specific demands within a projected capacity.

1.2 It is important to bear in mind that the operational scenarios are not static, for they are strongly influenced by alterations that may take place in the variables which compose each of these scenarios, such as meteorological issues, infrastructure, etc. Experience tells that in many times the outcomes that were planned were affected by factors which not always are possible to spot. So, it is mandatory to assess the capacity of a system in order to measure how deep it can be affected by one of these factors. Then, it is of fundamental importance to determine a capacity value which is feasible to be practiced for most of the time.

1.3 In such sense, the strategy to meet demands is to set an interval of capacity percentage that facilitates the absorption of flights even if there are alterations in the variables which cause the reduction of the capacity of one of the systems.

2. Discussion

2.1 The methodology used for calculating the runway capacity developed by Brazil uses, as basic benchmarks, factors related to arrival and departure operations along with planning factors. As a result, a number based upon average numbers is found which will result in an average capacity of a system. Nevertheless, some planning factors may interfere in the operability of the system and they must be taken into account for the measurement of the capacity percentage to be employed in a certain system.

2.2 Despite of the fact that these factors are not represented by mathematic parameters in the calculations, they must however to be considered as planning variables for capacity parameters and must also be counted for the determination of the capacity percentage to be employed in a system. They are called percentage adjustment tools.

3. Capacity percentage to be used in a system

3.1 CGNA professionals take into account the relation between the systems and the variables for their planning. The strategy is to attend the aviation demand until a certain capacity percentage limit which allows the accommodation of the flights, even if alterations of the variables drive to a reduction of the capacity of one of the systems. Thus, this percentage limit aims to plan the strategic demand, accommodate the tactical demand and minimize the operational restrictions impacts.

Strategical demand planning

3.1.1 The main objective when establishing a capacity percentage is to guarantee the operation of a system within a range in which the balance between capacity and demand occurs, despite of the influence of some planning variables.

3.1.2 On an ATFM perspective, the relation between capacity and demand orientates the strategical decision makings, pre-tactical and tactical phases to maintain the balance of the variables and enhance the traffic flow as much as possible. After determining the percentage capacity interval to be applied, the personnel in charge of ATFM apply such numbers to identify the peak moments and system congestions.

3.1.3 In this way, it is possible to adjust the demand so that unbalance points are eliminated, turning decision makings easier by the air traffic flow managers.

3.2 Accommodating tactical demand

3.2.1 The percentage capacity employed within a system has another objective that is to facilitate the tactical demand accommodation by systems inside the available structures. This traffic demand varies from system to system and has as one of its characteristics, the low predictability.

3.2.2 In this sense, in a shared airport, for instance, there must be places for accommodation of tactical demand (general aviation, military aviation, alternate flights and delayed flights), without exceeding the runway capacity.

3.2.3 So, in this case ATC Facilities and Airport administrations need to accommodate not only the scheduled demand but also the demand which appears in the tactical phase, and thus there must be a capacity percentage which facilitates this accommodation.

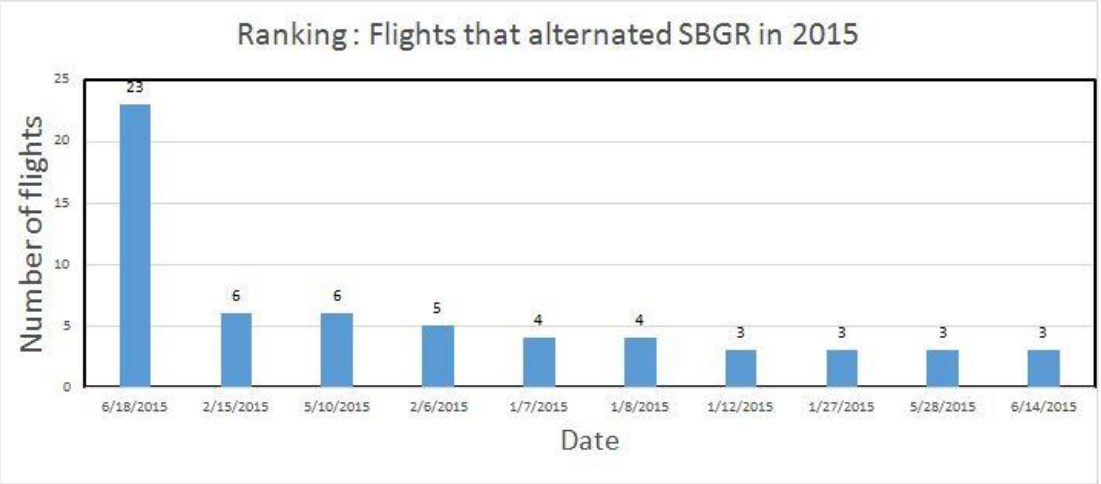
3.3 **Tactical demand components**

$\sum$ = % CAP

- **General Aviation**;
- **Military Aviation**;
- **Alternate Flights**; and
- **Delayed Flights**

Alternate flights

3.3.1 The capacity must also include alternate flights due to a variety of contingencies which can occur in certain specific period of times. The average of these alternate flights may vary according to the parking plans of the airports.



PICTURE 1

Delayed flights

3.3.2 Another factor that must be taken into account especially at busy airports is the "*ripple effect*" caused by delayed flights. At many times this aerial mesh need to be accommodated in peak times, circumstance which may raise the runway capacity of a certain airport over its limits.

3.4 **Minimizing operational restrictions impacts**

3.4.1 As described before, a system may be influenced by a great deal of factors which can impact negatively the operational variables driving the aerial demand absorption of the capacity to a downfall. Therefore, the ATFM must have a strategic reserve so as to minimize the negative impacts caused by meteorological situations, operational inconsistencies and deficient airport structures.

3.5 **Meteorological impact upon capacities**

3.5.1 The meteorological effects not always can be forecasted. The greater the aerial demand is, the bigger the efforts to keep the flow within the levels of safety and consequently, the workload will rise.

3.5.2 Meteorology is usually related to the increase of spacing in final approach, increase of runway occupation, and sometimes it hinders traffic flow until it comes to an interruption. All these things are factors which reduce capacity absorption in a system. Meteorology is also responsible for some of the delays and alternations at main Brazilian airports.

3.6 **Impacts upon capacity as a result of diverse operational patterns**

3.6.1 When the methodology for measuring capability is applied, one of the parameters to be considered in the assessments is the percentage of the runway occupation at the aerodrome throughout the year. In this case the theoretical values will always reveal the occurrence of a particular procedure. In some aerodromes the operational procedures at a certain runway differs completely from the other. In these types of aerodromes, these differences impact directly on the capacity values.

3.6.2 Each operational pattern will be related to a specific runway procedure and consequently to a runway capacity value. All procedures are considered and analyzed in the calculations, but the runway capacity will be deeply influenced by the operational procedure with more incidence and by the most restrictive pattern.

3.7 **Airport structure impacts upon capacity**

3.7.1 The adequate runway positions, rapid exit taxiways availability, platform offers, suitable courtyard layouts to the aircraft mix, availability of aerodrome NAVAIDS and the appropriate number of passengers terminal are supposed to be planned to meet demands of passengers in high seasons, or busiest periods.

3.7.2 The problem is that not always the airport structure is able to meet 100% of the runway capacity because, in some cases, there are limitations of courtyards and platforms.

3.7.3 Inside the airport logistics the structure amongst runway, courtyard and platform must be harmonized in such way that isolated capacity of a certain system does not hinder the capacity of the other. But as long as it does not happen it is mandatory to adopt a capacity percentage so as to meet demands considering the existing structure limitations.

4. **Conclusion**

4.1 When a capacity percentage is to be determined, the systemic issues related to capacity are analyzed. The State does not only considers isolated researches but also other relevant pieces of information about the airport operations, for instance. Besides data related to tactical demands and infrastructure, the operations as a whole are also taken into account, namely, the total number of operations in a year, the existence of restrictive configurations, purpose of the airport, number of passengers carried in a year time, airline companies demand, airport strategic importance in the national scenario, seasons, and likewise, the sensitivity level of the airport in relation to the economic scenario of the country.

4.2 It is important to highlight that these parameters used by the Brazilian State - **i.e., the adoption of 80% capacity percentage in some airports -** were practiced during the Major International Events held in the country namely the FIFA 2014 World Cup and the Olympics and Paralympics Rio 2016, in which, according to surveys, the busiest operations at airports directly or indirectly concerned in such events were registered, and the maximum capacities projected for those airports were never exceeded.

4.3 Actually, the capacity percentage to be applied depends still on the changes to occur at each of the systems. When 80% of the capacity is applied, it is not limiting one of the systems. To the contrary, it is allowing this system to be able to keep a safe and ongoing operation. Moreover, it is of fundamental importance to bear in mind that capacity is not a static number but an average.

4.4 After, of course, the system itself could exceed its capacity. Nevertheless, this will happen within the tolerable limits for all of those that are somehow connected to this system.

4.5 However, it is important to consider that each State must assess its internal characteristics and taking strategical decisions, apply the percentage that fits the most with its reality in order to keep the safety standards established. There is no way to establish a unique pattern for all States, as there are different political, operational and economic realities.

5. **Suggested action:**

5.1 The Meeting is invited to take note of the information provided.

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