

Infraestructura del Transporte Aéreo (ITA)

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EXERCISES FOR INFRAESTRUCTURA DEL TRANSPORTE AÉREO (ITA)

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SoW DELIVERABLE 2.6 – THEORETICAL AIRSIDE CAPACITY

Briefing

Palma de Mallorca airport (LEPA) is one of the busiest airports in Spain, especially during the summer season, when a high amount of airlines schedule flights to the Balearic Islands. The prognosis for the forthcoming years indicates a steady growth in traffic from all over Europe, but also the onset of operations of long-haul flights coming from Asia and the Americas. Taking into account that a significant amount of turboprop aircraft is already operating in the airport (due to the important volume of inter-island flights), this highly heterogeneous traffic may become challenging and, along with the potential growth in demand, the airport may reach its capacity limits. Your team will be in charge of assessing the airside capacity and hourly delay of LEPA both theoretically (D2.6) and using RAMS simulations. The main objective of this study is to identify which element of LEPA's airside is the bottleneck. This element should be the first to be subjected to modifications to increase the capacity of LEPA.

Material

- 1 Laptop per each two-people group and/or a scientific calculator
- Reference documents (see below)

Outline

During the scheduled hour, the teacher will give a brief presentation on airside capacity and you will start analysing the theoretical airside capacity of Palma de Mallorca's airport in groups of two people (halves of the Base Group).

Essential data for completing the assignment

Necessary information for students to be able to complete the assignment:

- LEPA airport runway-use configurations:
 - Configuration #1: West
 - IFR
 - 1 Arrivals RWY and 1 Departures RWY
 - Used 80% of the year
 - Configuration #2: East
 - IFR
 - 1 Arrivals RWY and 1 Departures RWY
 - Used 16% of the year
 - Configuration #3: West
 - IFR
 - 2 Arrivals RWYs and 1 Departures RWY
 - Used 0.5% of the year
 - Configuration #4: West
 - VFR
 - Used 1% of the year
 - 2.5% of the year the airport is closed because weather conditions are below airport minimums
- Air traffic data for LEPA during 2010:

- Configuration #1: 14233 ops type-A aircraft (A/C), 28466 B, 85397 C, 14233 D
- Configuration #2: 1484 ops A, 3859 B, 23750 C, 594 D
- Configuration #3: 131 ops A, 87 B, 611 C, 44 D
- Configuration #4: 1746 ops (including 169 Touch & Go ops)
- The Percent Arrivals (PA) was 50% for all configurations
- The RWY hourly demand was 42.15 ops/h for all configurations
- The total hourly demand for the gate groups was 204.96 ops/h
- The average daily demand during the peak month was 505.85 ops
- The average peak hour demand during the peak month 40.71 ops
- The peak 15 minutes demand was 14.23 ops
- Data regarding utilization of gate groups in LEPA:
 - Gate group R1:
 - 85% narrow-body (NB) A/C
 - NB A/C average gate time occupancy: 53.5 min
 - Wide-body (WB) A/C average gate time occupancy: 75 min
 - Gate group R2:
 - 80% NB A/C
 - NB A/C average gate time occupancy: 45 min
 - WB A/C average gate time occupancy: 72 min
 - Gate group R3:
 - 95% NB A/C
 - NB A/C average gate time occupancy: 45 min
 - WB A/C average gate time occupancy: 72 min
 - Gate group R6:
 - 80% NB A/C
 - NB A/C average gate time occupancy: 53.5 min
 - WB A/C average gate time occupancy: 75 min
 - Gate group R7:
 - 100% NB A/C
 - NB A/C average gate time occupancy: 45 min
 - Gate group R8:
 - 100% NB A/C
 - NB A/C average gate time occupancy: 45 min
 - Gate group R9:
 - 85% NB A/C
 - NB A/C average gate time occupancy: 53.5 min
 - WB A/C average gate time occupancy: 75 min

Delivery conditions

Prepare a PDF file reporting your results and upload it in ATENEA. You have to calculate:

- Hourly capacity of runway (RWY) components
- Hourly capacity of taxiway (TWY) components
- Hourly capacity of gate group components
- Airport hourly capacity
- Annual Service Volume (ASV)
- Hourly delay

You **MUST** present these results in your report using analogue tables to those in Annex 5 of the reference document FAA AC-150-5060-5 for each particular concept. **Only ONE** representative student of the two-people group should upload in ATENEA **ONE PDF FILE only** named using the following convention: D2.6_AirsideCapacity-XXYY.pdf, where XXYY is the name and family name of the **TWO members of the group**.

References

- [1] AENA: www.aena.es
- [2] Cruzado, M.G., "Ingeniería Aeroportuaria", ETSIA, Madrid, Spain, 1997.
- [3] FAA. Techniques for determining airport airside capacity & delay. RD-74-124, FAA, 1976.
- [4] FAA. Airport capacity & delay. AC-150-5060-5, FAA, 1983.
- [5] Llorenç, P. & Montano, R., "TFC – Análisis de capacidad del Aeropuerto de Barcelona", EETAC-UPC, Castelldefels, Spain, 2011.

SoW DELIVERY 8.2 – AIRPORT, TERMINAL AREA & EN ROUTE TAXES

Briefing

You and your team mates (the Base Group) are members of the staff of an airline based in Barcelona. Management is studying the feasibility of flying to several new destinations. Particularly, your boss asks you both to analyse the potential of operating flights to Gran Canaria. Thus, your team will be in charge of computing the airport taxes, terminal area (or approach) taxes and en route taxes for two case studies:

- Case study 1: An aircraft making a return trip from Barcelona-El Prat to Gran Canaria using representative data for both flights.
- Case study 2: Aside from having a glimpse on the order of magnitude of the costs associated to such type of flights, the main objective of the study you have been assigned is to compare the costs of the flight Barcelona-Gran Canaria with those for the return flight Gran Canaria-Barcelona, provided that all the parameters of the flight remain constant. For this purpose, although it is not representative of reality, in this case you will assume that the data is the same for both flights.

Material

- 1 Laptop/computer per each two-people and/or a scientific calculator
- Reference documents (see below)

Essential data for completing the assignment

Necessary information for students to be able to complete the assignment:

- See data for Case study 1 and Case study 2 in Table 1 and 2, respectively.

Table 1. Flight data for case study 1			
Concept	Bcn - GranCan.	GranCan. - Bcn	Observations
Fuel [litres]	9100	9400	In origin only
Lubricant [litres]	50	75	In origin only
MTOW [Tm]	75,5	75,5	
Cargo [Tm]	4,3	6,4	
Departing PAX	127	123	
Departure (local) time	8:00	18:00	
Arrival (local) time	10:30	22:30	
A/C acoustic category	2	2	
Block time in remote position [min]	--	67	Accounted for in origin only
Block time in finger position [min]	55	--	Accounted for in origin only

Table 2. Flight data for case study 2			
Concept	Bcn - GranCan.	GranCan. - Bcn	Observations
Fuel [litres]	9100	9100	In origin only
Lubricant [litres]	50	50	In origin only
MTOW [Tm]	75,5	75,5	
Cargo [Tm]	4,3	4,3	
Departing PAX	127	127	
Departure (local) time	8:00	18:00	
Arrival (local) time	10:30	22:30	
A/C acoustic category	2	2	
Block time in remote position [min]	--	55	Accounted for in origin only
Block time in finger position [min]	55	--	Accounted for in origin only

- Important remarks for computation of airport taxes:
 - You should take into account only the concepts listed under the topic “Prestaciones patrimoniales”, and the concepts 8 and 9 under the topic “Precios privados”, in ref. [2].
 - All concepts are only accounted for once per flight (i.e. either in the origin or in the destination airport), except from the costs associated to cargo operations, which must be computed in origin and destination for each flight. For example:
 - In each flight, energy supply at 400 Hz is requested in the origin airport.
 - In each flight, a cleaning service of platform is requested in the origin airport due to flushing of kerosene when filling the fuel tanks. The cost of the product used by the cleaning service is 59.95 € in Barcelona-El Prat (55.95 € in Gran Canaria).
 - Costs associated to parking of A/C are only accounted for in the origin airport for each flight.
 - Costs associated to fuel and lubricants are only accounted for in the origin airport for each flight.
 - Costs associated to cargo operations are accounted for in both the origin and destination airports for each flight.
- Important remarks for computation of en route taxes:
 - The unit rate for FIR/UIR Casablanca is 51.56 €
 - 2/5 of the great circle distance between the origin and destination airport fall within the FIR/UIR Barcelona and Madrid.
 - Another 2/5 of the great circle distance fall within the region of FIR/UIR Casablanca.
 - The last 1/5 of the great circle distance falls within the region of FIR/UIR Canarias.

Delivery conditions

Prepare a PDF file reporting your results and upload it in ATENEA. You have to calculate and report the taxes associated to:

- Airport services:
 - Landing & transit service in the aerodrome
 - PAX, PMRs & Security
 - Parking of A/C in remote position
 - Parking of A/C in finger position
 - Cargo operations
 - Fuel & lubricants
 - Land side servicing
 - Energy supply at 400 Hz
 - Cleaning service of platform
- Terminal area (or approach) service

- En route ATC service

for the flights Barcelona-Gran Canaria and Gran Canaria-Barcelona for both Case study 1 and Case study 2. Compare the total airport taxes and the total flight costs (airport + terminal + en route taxes) for each flight in each case study. Compare also the airport taxes associated to PAX, PMRs & Security for **ONE** passenger only for each flight. You **MUST** present these results in clear and concise tables. **Only ONE** representative student of the Base Group should upload in ATENEA **ONE PDF FILE only** named: D8.2_AirportTaxes_XX.pdf, where XX is the name and family name of the **representative of the group**.

References

- [1] AENA: www.aena.es (AENA > Navegación Aérea > AIS > AIP > AD).
- [2] AENA Aeropuertos, "Guía Tarifas 2011", Ed. Junio 2011.
- [3] Eurocontrol website: www.eurocontrol.int
- [4] Mencía, "Nociones de Trigonometría esférica".
- [5] Reynolds, T.G., "Development of Flight Inefficiency Metrics for Environmental Performance Assessment of ATM", 8th USA/Europe Air Traffic Management Research & Development Seminar (ATM2009), 2009.

SoW DELIVERABLE 8.3 – AIP EXERCISE 01

Briefing

You and your team mate (you will work in 2-people groups, halves of the Base Groups) will have to look for the requested information throughout the Spanish AIP, available online. There are 2 different statements of work (SoW). A half of the Base Group has to look for the information requested in SoW #1, and the other half, that in SoW #2. This is SoW #1.

Material

- 1 Laptop/computer per each two-people group and internet connection
- Reference documents (see below)

Outline

- A debriefing is made in week 09, where the solutions given by students are reviewed

Assignment

Find the following information:

1. Is it possible to find paper copies of the AIP in the aerodromes managed by AENA?
2. Which is the difference between an “enmienda regular” and an “enmienda AIRAC”?
3. Which ICAO documents are taken into account to elaborate the AIP-España?
4. Is there any difference between the information in the AIP and the ICAO Documents and Annexes? If so, where are these differences listed?
5. Which are the aeronautical authorities recognized by the AIP in Spain?
6. Which conditions must fulfil an aircraft to make a regular/scheduled flight?
7. Which countries apply the Schengen Treaty?
8. Which are the RNAV routes within Barcelona, Canarias and Madrid FIR/UIR?
9. Which conditions must fulfil the RNAV-equipped aircraft to be allowed to operate under IFR on RNAV Terminal Area Procedures?
10. What conditions must fulfil aircraft to case with the requirement of GNSS-based RNAV?
11. May an aircraft carrying a single RNAV system not meeting an average continuity of service of 99.99% of flight time be approved for B-RNAV operations?
12. What types of aircraft do not require RVSM approval for operating in the RVSM airspace within Madrid, Barcelona and Canarias FIR/UIR?
13. What type of radio equipment is mandatory for flights operating as general air traffic above FL195 in FIR/UIR Barcelona and Madrid?
14. For which purpose serves a NOTAM?
15. What is an Aeronautical Information Circular (AIC)?
16. Which authority is responsible for the production of aeronautical charts? And which one is responsible for their distribution?
17. Which are the features and characteristics of Standard Instrument Departure (SID) charts?
18. Which are the features and characteristics of STAR charts?
19. Which authority is responsible for providing ATS services to international civil aviation in Spain?
20. In the Spanish FIR/UIR, to which FL is limited the ATC service in those areas where it is provided? Is this service extended to lower levels somewhere? If so, in which areas?

21. What is the purpose of the Alerting service (ALRS)?
22. How have the minimum flight altitudes on the ATS routes been established?
23. Which types of meteorological broadcastings are available for aircraft use in flight?
24. Which organism is the provider of meteorological services in support of air navigation? In compliance with which legislation?
25. Which organisation is responsible for the Search and Rescue (SAR) Service?
26. Which organisation is responsible for the management of the operative air traffic?
27. Where are the general rules of air traffic procedures applicable in Spain published?
28. Which are the minimum conditions of visibility and distance from clouds for VFR/OVFR flights above FL 100 in C-class airspace?
29. When can military OVFR night flights (between sunset and sunrise) be done in visual flight conditions?
30. Are VFR flights allowed to operate above FL 195 in Madrid, Barcelona and Canarias FIR/UIR?
31. Except when necessary for take-off or landing, at which height shall a VFR flight operate?
32. Can an aircraft change its flight from IFR to VFR? If so, what should the pilot do?
33. Which transmission shall the flight crew fully read back to the ATC?
34. May aircraft entering or overflying a TMA stop keeping the flight paths indicated in the appropriate charts?
35. In a SID, can an aircraft fly below the flight level indicated in a clearance? And above?
36. In PSR surveillance, which is the radar horizontal separation minima value established between primary targets or a primary and a secondary target?
37. In en-route SSR surveillance, which is the radar horizontal separation minima value in Sevilla ACC if the processing mode is with civil autonomous mono-radar?
38. In APP surveillance, which is the radar horizontal separation minima value in Santiago APP if the radar setting is normal and autonomous multi-radar?
39. In TWR surveillance, which is the radar horizontal separation minima value in Barajas TWR if the radar setting is normal and autonomous multi-radar?
40. As per SSR, what shall pilots do in the event of an aircraft radio receiver failure?
41. At which atmospheric pressure level is located FL 0? How long is the interval between consecutive flight levels?
42. Which is the vertical dimension, in FL, of the Madrid ACC RVSM Transition Area between the NAT region and the EUR region?
43. Which are the in-flight contingency procedures for aircraft detecting wake turbulence from other aircraft within RVSM airspace in the NAT region?
44. How are aircraft classified as per wake turbulence?
45. What is SOMAN? Report its characteristics.
46. What is LETO IAC/8? Report its characteristics.

Delivery conditions

Prepare a PDF file reporting the requested information. **Only ONE** representative student of the two-people group should upload in ATENEA **ONE PDF FILE** named: D8.3_AIPexercise01-XX-YY.pdf, where XX-YY is the name and family name of the **TWO members of the group**.

References

- [1] AENA: www.aena.es

SoW DELIVERABLE 8.3 – AIP EXERCISE 02

Briefing

You and your team mate (you will work in 2-people groups, halves of the Base Groups) will have to look for the requested information throughout the Spanish AIP, available online. There are 2 different statements of work (SoW). A half of the Base Group has to look for the information requested in SoW #1, and the other half, that in SoW #2. This is SoW #2.

Material

- 1 Laptop/computer per each two-people group and internet connection
- Reference documents (see below)

Outline

- A debriefing is made in week 09, where the solutions given by students are reviewed

Assignment

Find the following information:

1. Is the AIP information contained in www.aena.es considered legally authentic?
2. How is the information provided by the AIP updated?
3. Under which authority is the military aeronautical information published?
4. Which documents are taken into account to elaborate the available charts?
5. What is the AIP? What is the minimum duration of a temporary issue for the corresponding information to be published in the AIP?
6. Which are the institutions responsible for providing aeronautical services and the service of Airport Flight Information (AFIS), respectively?
7. Which documents are required for dispatching an aircraft upon arrival and departure?
8. Can crew members travel without passport and/or the corresponding visa? If so, under which conditions?
9. Which equipment shall carry on-board, as a minimum, aircraft operating on RNAV routes within Barcelona, Canarias and Madrid FIR/UIR?
10. What type of procedures are the aircraft equipped with GNSS-based RNAV allowed to use?
11. What conditions must fulfil RNAV procedures to be designated GNSS?
12. Which documents provide guidance on the airworthiness, continued airworthiness and the operational practices and procedures for the EUR RVSM airspace?
13. What type of radio equipment is mandatory for flights operating as general air traffic above FL195 in FIR/UIR Barcelona and Madrid?
14. Which are the limits of the RVSM airspace in Spain?
15. How is national and international dissemination of NOTAM achieved?
16. What series of AIC can be found?
17. On which documents is based the elaboration of the civil aeronautical charts?
18. Which are the features and characteristics of Aerodrome/Heliport charts (ADC/HELIC)?
19. Which are the features and characteristics of Instrument Approach charts (IAC)?
20. Which types of ATS services are provided to international civil aviation in Spain?
21. The ATC service is made up of...
22. The Aerodrome Flight Information Service (AFIS) provides...

23. Which types of radio aids to navigation are available?
24. Which is the authority responsible for the meteorological service in Spain?
25. Which information do ATIS messages contain?
26. In which ICAO documents is based the Search and Rescue (SAR) Service?
27. With what do the general rules of air traffic procedures applicable in Spain conform?
28. The operation of an aircraft in flight must comply with...
29. Unless cleared by ATC, under which conditions VFR flights shall not take-off from or land at a controlled aerodrome / heliport located within or outside a CTR?
30. Are VFR flights allowed to operate at transonic and/or supersonic speeds?
31. Can military OVFR flights operate above FL200 at a speed higher than 1.0 Mach within Barcelona and Madrid FIR/UIR?
32. When no minimum flight altitude has been established in a specified airspace, at which level shall be IFR flights flown?
33. On which documents are civil holding, approach and departure procedures based?
34. At which speeds shall be flown the holding patterns?
35. Which is the procedure that a VFR aircraft must follow to cross a control zone, or aerodrome traffic zone?
36. Which is the procedure for an IFR flight attempting to depart from an AFIS aerodrome?
37. In en-route SSR surveillance, which is the radar horizontal separation minima value in Sevilla ACC if the processing mode is with normal and autonomous multi-radar?
38. In APP surveillance, which is the radar horizontal separation minima value in Bilbao APP if the radar setting is normal and autonomous multi-radar?
39. In TWR surveillance, which is the radar horizontal separation minima value in Barcelona TWR if the radar setting is normal and autonomous multi-radar?
40. How is the vertical position of an aircraft expressed?
41. Which is the transition altitude (TA) in Spanish aerodromes?
42. Within EUR RVSM airspace where RVSM transition tasks are not carried out, which is the vertical separation minimum between RVSM approved aircraft?
43. Which are the procedures defined for controlled flights operating in visual meteorological conditions (VMC) when an air-ground communications failure occurs?
44. What is MAELLA? Report its characteristics.
45. What is PIVON? Report its characteristics.
46. What is LEXJ IAC/2? Report its characteristics.

Delivery conditions

Prepare a PDF file reporting the requested information. **Only ONE** representative student of the two-people group should upload in ATENEA **ONE PDF FILE** named: D8.3_AIPexercise02-XX-YY.pdf, where XX-YY is the name and family name of the **TWO members of the group**.

References

- [1] AENA: www.aena.es