



Agenda Item 3: Implementation of air traffic flow management (ATFM)

ATFM IMPLEMENTATION IN PERU

(Presented by Peru)

SUMMARY	
<p>This working paper presents the status of implementation of ATFM in Peru, the actions taken, the benefits obtained, and the difficulties encountered to complete the implementation. It also presents performance indicators of the ATFM system, highlighting the benefits to be obtained from a collaborative approach among the aeronautical community for addressing capacity management to enhance efficiency and safety.</p>	
<p>References:</p> <ul style="list-style-type: none">– Doc 9750, Global Air Navigation Plan;– SAM/IG/12, 13, 14, 15, 16, and 17 meeting reports;– GREPECAS/17 meeting report;– Report of the Fourth Meeting of the Programmes and Projects Review Committee (PPRC/4).– Final report of the Third Meeting of Air Navigation and Safety Directors.	
<p>ICAO strategic objectives:</p>	<p><i>A - Safety</i> <i>B – Air navigation capacity and efficiency</i> <i>E – Environmental protection</i></p>

1. Background

1.1. The Declaration of Bogota was signed at the Thirteenth Meeting of Civil Aviation Authorities of the Region (RAAC/13, Colombia, December 2013), whereby the States of the Region took on the responsibility of implementing the air traffic flow management (ATFM) service, installing at least one FMU or FMP at the ACCs by 2016.

1.2. In 2015, Peru drafted the action plan for ATFM implementation in the LIMA FIR, and analysed available capacity and foreseen demand, which helped define the scenario for deciding on ATFM implementation.

1.3. On 25 January 2016, Peru implemented ATFM through the LIMA FMP, with a view to the adoption of measures to promote an efficient, orderly, and safe air traffic flow, and to properly meet service demand in take-off and landing operations at domestic airports, since congestion levels were causing delays in public service itineraries that were essential for passengers.

1.4. At the Seventeenth workshop/meeting of the SAM Implementation Group (SAM/IG/17) held in May 2016, Peru submitted IP/8 containing details of the action taken and the status of implementation of ATFM. Likewise, in item 3.28 of the final report of the meeting, the meeting requested Peru to provide detailed information on ATFM implementation and operation, which is being presented in this working paper.

1.5. In item 1.8 of its final report, the Third Meeting of Air Navigation and Safety Directors, held in Lima on 22-24 August 2016, requested Peru to make a presentation to explain the use of CTOT.

2. Discussion

Updated status of implementation of ATFM in Peru

2.1 Having identified that the constant increase of itineraries is the main cause of the imbalance between demand and capacity, an initial Excel template was developed in June 2016 for use in strategic planning and itinerary organisation. Using the template, it was possible to compare air traffic demand with declared capacity, so as not to exceed such capacity when programming the itineraries. To date, capacity analyses have been conducted at 19 airports.

2.2 Improvements in strategic planning through the organisation and programming of itineraries have an impact on flow management efficiency since, at present, it is no longer necessary to apply more restrictive measures, such as aircraft ground stop (GS) as applied in the initial phase of the FMP during airspace saturation periods.

2.3 It has been determined that the traffic management initiative (TMI) that is best suited to our scenario is the application of a ground delay programme (GDP) involving a continuous analysis of the daily scheduled flow of arrivals and departures. With the GDP, arrival slots are assigned to regulate inbound IFR traffic at the International Airport Jorge Chávez in Lima. To this end, the Lima FMP assigns departure slots at each aerodrome at national level, using ETD as the basis for calculation, in coordination with the pilot. To this end, consideration is given to traffic and meteorological conditions at the aerodrome in order to generate a calculated take-off time (CTOT), which is provided to users on an equal basis. All this process is executed with the basic ATFM tool of the INDRA AIRCON 2100 system. An explanatory video will be shown during the presentation of this working paper.

2.4 Following ICAO recommendations regarding the domino effect generated by NOTAMs concerning control of flows to adjacent FIRs and other Regions, and having improved flow management, flow control NOTAMs that established specific separations regardless of flight level have been cancelled to avoid their impact on flight planning and planned fuel reserves, especially in international flights.

2.5 The initiatives of the Global Air Navigation Plan contain strategies to improve the use of existing system capacity. Within this context, the implementation of short tow procedures was completed on 15 August 2016 at the Jorge Chávez International Airport, with a view to improving the use of the movement area. This has generated the following benefits:

- Apron occupancy time for towing and start-up manoeuvres was reduced in 5 minutes per aircraft in average.
- Ground controller workload reduced since the phraseology used for the short tow procedure reduces significantly the time used for communications.

2.6 Continuing with the activities foreseen in the Plan for ATFM implementation at the LIMA FIR (the updated ATFM plan is shown in **Appendix A** to this paper), it was felt necessary to implement a flow management unit for the Cusco airport, since traffic demand exceeds available capacity at certain times of the day, mainly due to apron limitations. The Cusco FMP will start operating on 17 September 2016 on a trial basis. Its operation is based on ATFM tactical planning and its main objective is to manage traffic arriving in Cusco. The ATFM initiative applied is the ground delay programme (GDP), assigning a calculated take-off time (CTOT) to domestic traffic destined for Cusco. In order to offset the effect that this measure may have on the Lima airport, flights leaving from Lima to Cusco (category C or less aircraft) depart from the intersection of runway 15 with taxiway Bravo (15/B, remaining runway length 2300m).

2.7 Upon assessing the effect of departures from the intersection (15/B), which reduced runway occupancy time and improved sequencing of departures from Lima, it was concluded that this measure should be used as a tool to assist the ground controller to organise departure flow.

2.8 In order to introduce the use of ATFM messaging, the Cusco FMP is using this type of messages during the trial phase through the AMHS system to coordinate the application of ATFM initiatives with the Cusco control units.

2.9 Despite these measures, the constant growth of air traffic demand continues to cause congestion during certain periods of the day. Consequently, coordination started with IATA to declare the AIJCH as a coordinated airport of level 2, in accordance with IATA WSG (*Worldwide Slots Guidelines*). It is estimated that the itinerary adjustments agreed between the airlines and the designated itinerary coordinator will facilitate the operations of airlines that use or expect to use the airport.

2.10 In this regard, the following tasks are underway regarding itineraries:

- Itineraries will be approved for 2 seasons for purposes of strategic planning, starting the following season.
- Itineraries for the summer season of 2017 will be systematised, distributing them in 15-minute slots according to hourly capacity. At present, 92% of itineraries are systematised and easily recognizable.
- On-going coordination among the aeronautical community for the resolution of common problems in a transparent and equitable manner for all airlines.

2.11 Although CDM has not been formally established, its methodology is being applied for strategic planning in order to find the best solution to ATFM-related issues, reducing delays and optimising the use of available resources. Within this process, a series of meetings have been held to provide information to stakeholders, support collaborative decision-making, and enhance safety and efficiency. This experience has highlighted the importance for all parties involved to be aware of the actual and foreseen conditions before making a decision.

2.12 The following difficulties were identified during ATFM implementation:

- Some airlines were making improper use of the MEDEVAC (*medical evacuation*) STATUS in order to bypass the adopted ATFM measures, causing a negative impact on air traffic flow management, especially during peak hours. Accordingly, it is recommended that surveillance and continuous monitoring of operations be implemented during the period in which ATFM initiatives are being applied.

- An analysis was done to classify delays before take-off, showing that the main cause of congestion at the AIJCH and AIVA was the limited airport infrastructure. At present, infrastructure improvements are being planned to address demand growth. To this end, capacity studies are being updated.

2.13 In order to monitor ATFM system performance, initial performance indicators have been developed in order to establish continuous improvement processes to enhance system efficiency. Performance indicators have been selected based on historical data availability and the objectives defined for this stage (**Appendix B** describes the indicators for discussion by the Meeting).

2.14 In order to promote ATFM implementation at regional level, Peru is coordinating with neighbouring administrations, and proposing the incorporation of ATFM measures in existing letters of operational agreement.

2.15 In this regard, communications/teleconferences were held with Ecuador in order to coordinate and assess proposals. However, no consensus was reached regarding actions to be taken within the ATC/FMP coordination loop and their impact on controller workload. It has been deemed advisable to establish a Letter of operational agreement between ATFM units.

2.16 Likewise, contact has been established with the Bolivian administration, pending the definition of a first meeting.

2.17 Coordination is currently taking place with the Colombian administration to update the respective Letter of operational agreement, expecting a favourable evolution of ATFM procedures between the two countries.

2.18 Finally, based on the experience obtained, the Peruvian administration suggests that capacity studies and air traffic demand forecasts be analysed in order to determine the real need for ATFM services.

3. **Suggested action**

The Meeting is invited to:

- a) take note of the information presented herein;
- b) urge the administrations to provide the support required for successful implementation of their respective ATFM units and integration of FMPs of States with adjacent FIRs;
- c) discuss any other related issue it may deem appropriate.

APPENDIX 1

ACTION PLAN FOR ATFM IMPLEMENTATION AT THE LIMA FIR

(UPDATED TO 30 SEPTEMBER 2016)

Description of tasks	Date	Status	Responsible party (person or agency in charge)	Remarks
1. Demand and capacity analysis: Airport and airspace				
1.1. Calculate runway capacity of the main airports. a) Calculate runway capacity at AIJCH (Lima) b) Calculate runway capacity at AIVA (Cusco)	Jul/2014 Feb/2015	Completed Completed	DGAC - Peru DGAC - Peru	Calculation results shall be updated if a significant variation in factors affecting capacity is observed.
1.2. Calculate airspace capacity. a) Lima ACC ATC sector capacity b) Cusco TMA ATC sector capacity	Sep/2014 Feb/2015	Completed Completed	CORPAC S.A. DGAC - Peru	
1.3. Calculate apron capacity at the main airports. a) Apron capacity at AIJCH (Lima) b) Apron capacity at AIVA (Cusco)	Sep/2015 Feb/2015	Completed Completed	LAP DGAC – Peru	At present, information is available for 19 airports at national level.
1.4. Calculate airport capacity at the main airports in terms of operation of aircraft. a) Airport capacity at AIJCH (Lima) b) Airport capacity at AIVA (Cusco)	Sep/2015	Completed Underway	LAP CORPAC S.A	CORPAC submitted plans for conducting the AIVA airport capacity study.
1.5. Present the conclusions of sector, runway, and apron capacity studies	Sep/2014 - Apr/2015 - May/2015	Completed	DGAC - Peru	If necessary, studies will be updated in coordination between DGAC and CORPAC

ACTION PLAN FOR ATFM IMPLEMENTATION AT THE LIMA FIR

Description of tasks	Date	Status	Responsible party (person or agency in charge)	Remarks
2. Foreseeing demand				
2.1. Conduct airspace and major airport demand studies for the next 10 years as a minimum.	Oct 2014	Completed	DGAC - Peru	LAP and LAN developed demand forecasts up to 2040; studies were presented at the ACC (Airport Consultative Collaborative) meeting.
2.2. Identify operational factors affecting demand and capacity at major airports and airspaces in order to optimise existing capacity, including simulations as needed.	Sep/2014 - Apr/2015- May/2015	Completed	DGAC - Peru	Factors have been identified and measures are being taken to optimise capacity.
2.3. Develop a database to analyse arrival and departure demand at major airports and airspaces in annual, monthly, daily, and hourly increments.	-	Completed	DGAC - Peru CORPAC S.A	The DGAC has an application for recording flight intentions of airlines. At present, the IATA WSG best practices are being adopted for itinerary scheduling.
2.4. Identify periods during which demand exceeds actual and foreseen capacity, and then take the measures required for demand/capacity balancing during the 3 ATFM phases: strategic, tactical, and pre-tactical.		Ongoing	CORPAC S.A DGAC - Peru	Traffic evolution is regularly assessed in order to identify the most appropriate TMIs.

ACTION PLAN FOR ATFM IMPLEMENTATION AT THE LIMA FIR

Description of tasks	Date	Status	Responsible party (person or agency in charge)	Remarks
3. Coordination with ATM community				
3.1. Define and conduct briefing meetings with stakeholders regarding ATFM/CDM development plans, processes and procedures.	Start Oct/2014	Ongoing	DGAC - Peru	An A-CDM committee was created for AIJCH, chaired by LAP. Coordination meetings were held and inaugural CDM scheduled for March 2016.
3.2. Train stakeholders in CDM processes and procedures.		Pending	DGAC - Peru	This will be achieved through seminars, replicating ATFM courses, and developing training programmes.
3.3. Establish CDM processes for effective management and exchange of information, allowing each participant to be aware of relevant information for decision-making by the other participants.		Underway	CORPAC S.A. DGAC - Peru	CDM methodology is applied for strategic planning.
3.4. Identify the staff and operational telephone numbers that will serve as points of contact for TFM issues in each ACC, TMA, TWR, airline CCO, airport CCO, meteorology, military, general aviation, and others.		Ongoing	CORPAC S.A. DGAC - Peru	List of ATFM contacts updated in August 2016.

ACTION PLAN FOR ATFM IMPLEMENTATION AT THE LIMA FIR

Description of tasks	Date	Status	Responsible party (person or agency in charge)	Remarks
4. Policies, standards, and procedures				
4.1. Publish the information on ATFM at the Lima FIR in the corresponding AIP/AIC.	May/2016	Completed	DGAC - Peru	AIP SUPPLEMENT 18/16 published on 2 May 2016
4.2. Develop a basic ATFM operational concept. a) Development of ATFM CONOPS for the LIMA FIR b) Development of the ATFM Manual for the LIMA FIR	Jan/2016	Completed	DGAC - Peru	CONOPS expected to be completed for FMP operational stage
4.3. Develop procedures for communication and coordination among ATFM units for the implementation of air traffic flow management measures.	Jan/2016	Completed	DGAC - Peru CORPAC S.A.	During the first stage for the Lima FMP, ACC, Lima TWR, and provincial units.
4.4. Identify meteorological information that could be shared to assess the impact of meteorological conditions on capacity.	Mar/2016	Completed	CORPAC S.A.	Continuous assessment
4.5. Develop letters of operational agreement between ATFM units for demand/capacity balancing.		Underway	CORPAC S.A.	Initial coordination procedures have been developed between CUSCO FMP and LIMA FMP
4.6. Apply a strategy for the implementation of flexible use of airspace (FUA): a) Assess airspace management processes. b) Improve domestic airspace management for the introduction of dynamic traffic flow changes during the tactical stage. c) Improve ground ATS systems and associated procedures for extending the FUA. d) Dynamic implementation of ATC sectorisation in order to improve demand/capacity balancing for real-time response to changing flow conditions.		Pending	CORPAC S.A. DGAC - Peru	The corresponding studies shall be conducted for the implementation of the flexible use of airspace in Peru.

ACTION PLAN FOR ATFM IMPLEMENTATION AT THE LIMA FIR

Description of tasks	Date	Status	Responsible party (person or agency in charge)	Remarks
5. Training				
5.1. Replicate ATFM implementation courses and workshops provided by ICAO.	Apr/2016	Completed	DGAC - Peru	ATFM seminar/workshop was conducted
5.2. Develop ATFM training plans for the ATM community, including: a) ATFM workshops b) FMP/FMU training c) Training in CDM and A-CDM		Ongoing	DGAC - Peru	To be conducted periodically.
6. ATFM implementation				
6.1. Define the required ATFM structure (organisational chart)	Jan/2016	Completed	CORPAC S.A. DGAC - Peru	Structures included in ATFM manuals of both DGAC and CORPAC
6.2. Define the location and implementation of FMP units at the main airports.	Dec/2015	Completed	DGAC - Peru	An FMP was implemented in Lima, the Cusco FMP starts testing period on 17 September 2016
6.3. Declare ATFM implementation by stages. a) Testing stage (6 months) b) Pre-operational stage for the Lima-Cuzco flow (3 months) c) Operational stage (3 months)	Dec/2015	Completed	CORPAC S.A. DGAC - Peru	This statement was made in AIC 15/15, updated in AIP Supplement 18/16.
6.4. Establish a date for starting FMP operations.	25/01/2016	Completed	CORPAC S.A. DGAC - Peru	Testing stage started on 25/01/2016, at present in pre-operational stage.

ACTION PLAN FOR ATFM IMPLEMENTATION AT THE LIMA FIR

Description of tasks	Date	Status	Responsible party (person or agency in charge)	Remarks
7. System performance monitoring				
7.1. Develop performance indicators in accordance with the CDM manual		Completed	DGAC - Peru CORPAC S.A.	Performance indicators have been developed based on the CDM manual. Other indicators are expected to be developed based on the ATFM system of Peru and available information.
7.2. Develop a performance indicator monitoring programme		Underway		
7.3. Develop an ATFM post-implementation monitoring programme		Underway		

APPENDIX B

PERFORMANCE INDICATORS OF THE ATFM SYSTEM IN PERU

I. USE OF RUNWAY DECLARED CAPACITY

STRATEGIC OBJECTIVE Increase and optimise runway performance		
PERFORMANCE DIRECTIVE	PERFORMANCE INDICATOR	PERFORMANCE MEASUREMENT
FILL THE GAP BETWEEN OPERATIONAL AND DECLARED RUNWAY CAPACITY AT AIJCH	COMPLIANCE WITH DECLARED RUNWAY CAPACITY	COMPARE NUMBER OF ACTUAL OPERATIONS WITH DECLARED CAPACITY
ANALYSE IMBALANCE BETWEEN NUMBER OF ARRIVALS AND DEPARTURES	OPERATIONAL CAPACITY BELOW OR ABOVE DECLARED CAPACITY	COMPARE NUMBER OF ARRIVALS (BY SCHEDULE, TYPE, AND ORIGIN), AND EFFECT ON OPERATIONAL CAPACITY

Note 1: Runway declared capacity (RDC) of AIJCH - 35 operations at 95%

1. Compare the actual number of operations with declared capacity:

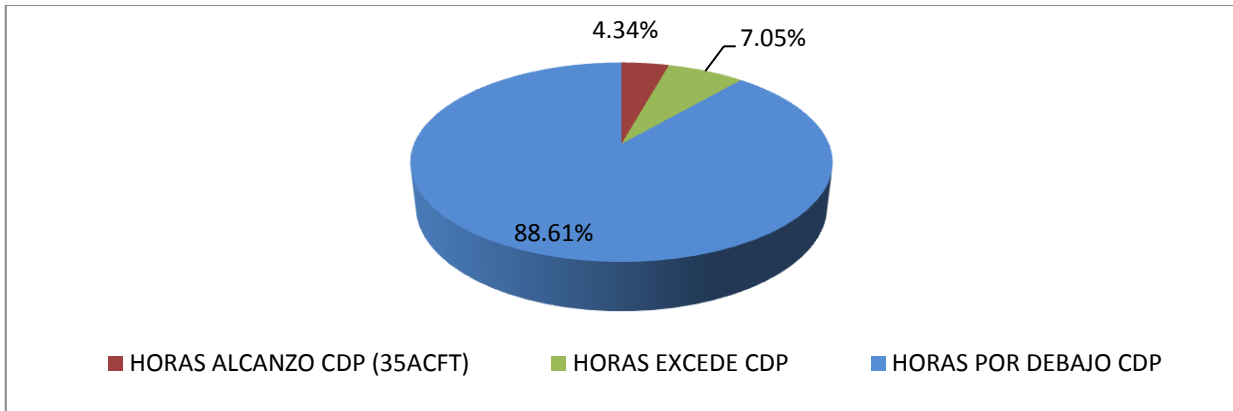
1.1. Daytime shift: 1200-1600 UTC

In a total sample of 1220 hours of operation of the Lima FMP, RDC was reached in 4.35% of total, was exceeded in 7%, and remained below in 88.65%. (See table 1 and graph 1)

Table 1.- Compliance with runway declared capacity at AIJCH – daytime shift

	HORAS TOTAL FMP DIA	TOTAL OP FMP DIA	HORAS ALCANZO CDP (35ACFT)	% HORAS ALCANZO CDP (35ACFT)	HORAS EXCEDE CDP	% HORAS EXCEDE CDP	HORAS POR DEBAJO CDP	% HORAS POR DEBAJO CDP
ENERO	155	4317	8	5.16	11	7.10	136	87.74
FEBRERO	145	4025	7	4.83	4	2.76	134	92.41
MARZO	155	4362	8	5.16	12	7.74	135	87.10
ABRIL	150	4169	11	7.33	9	6.00	130	86.67
MAYO	155	4328	3	1.94	7	4.52	145	93.55
JUNIO	150	4031	1	0.67	7	4.67	142	94.67
JULIO	155	4392	10	6.45	16	10.32	129	83.23
AGOSTO	155	4422	5	3.23	20	12.90	130	83.87
TOTAL	1220	34046	53	4.35	86	7.00	1081	88.65

** Data from SIRSO CORPAC, prepared by the DGAC ATFM team*

Graph 1.- Percent distribution of compliance with runway declared capacity at AIJCH – daytime shift**1.2. Nighttime shift: 2200-0300 UTC**

For the nighttime shift, a total sample of 1464 hours of operation of the Lima FMP was analysed, 99.66% of which remained below the RDC, and RDC was reached in 0.34%. Consequently, the imbalance between the number of arrivals and departures makes it difficult to optimise RDC.

2. Compare the number of arrivals (by schedule, type, and origin), and their impact on operational capacity**2.1. Nighttime shift: 2200-0300 UTC**

The acceptance rate at AIJCH is 18 arrivals per hour. In a sample of 1464 hours of operation of the FMP, the established rate was reached 7.79% of the time, it was exceeded 17.9% of the time, and was not reached 74.32% of the time. (See table 2 and graph 2)

If the RDC is not achieved, there is airspace congestion due to:

- Arrival/departure imbalance: many arrivals and few departures make it difficult to optimise capacity.
- Originating sector:
 - a) Daytime shift: 70% of flow from the South and 30% from the North.
 - b) Nighttime shift: 17% of flow from the South and 83% from the North.
- Type of flow:
 - a) Daytime shift: 73.3% domestic flow and 26.7% international flow
 - b) Nighttime shift: 22.87% domestic flow and 77.13% international flow

Note 2: Domestic traffic is subject to ATFM measures (GDP); inasmuch as possible, priority is given to international traffic.

Table 2.- Compliance with acceptance rate established for the Lima FMP at AIJCH

HORAS TOTAL FMP NOCHE	TOTAL ARR FMP NOCHE	HORAS ALCANZÓ REGIMEN	% HORAS ALCANZÓ REGIMEN	HORAS EXCEDE REGIMEN	% HORAS EXCEDE REGIMEN	HORAS POR DEBAJO DEL REGIMEN	% HORAS POR DEBAJO DEL REGIMEN
186	2575	13	6.99	38	20.43	135	72.58
174	2389	10	5.75	22	12.64	142	81.61
186	2619	13	6.99	26	13.98	147	79.03
180	2636	18	10.00	37	20.56	125	69.44
186	2803	9	4.84	41	22.04	136	73.12
180	2624	14	7.78	31	17.22	135	75.00
186	2808	16	8.60	37	19.89	133	71.51
186	2737	21	11.29	30	16.13	135	72.58
1464	21191	114	7.79	262	17.90	1088	74.32

** Data from SIRSO CORPAC, developed by the DGAC ATFM team*

2.2. Daytime shift: 1200-1600 UTC

RDC is optimised during this shift given the balance that exists between the number of scheduled arrivals and departures.

II. COMPLIANCE WITH THE CALCULATED TAKE-OFF TIME (CTOT)

STRATEGIC OBJECTIVE		
Compliance with ATFM measures		
PERFORMANCE DIRECTIVE	PERFORMANCE INDICATOR	PERFORMANCE MEASUREMENT
INCREASE THE PERCENTAGE OF FLIGHTS WITHIN THE CTOT	COMPLIANCE WITH THE CTOT	<p>COMPARE THE CTOT WITH ACTUAL TAKE-OFF TIME FOR FLIGHTS SUBJECT TO ATFM MEASURES</p> <p>CALCULATE THE PERCENTAGE OF NON-COMPLIANCE WITH CTOT</p>

Note 1: The Lima FMP has established a CTOT compliance range of $-1'/+1'$.

1. Compare CTOT with the actual take-off time for flights subject to ATFM measures and assess the percentage of non-compliance with the CTOT

1.1. Daytime shift: 1200-1600 UTC

A sample of 3256 flights conducted during the Lima FMP operating hours was taken, of which 1996 flight were subject to a CTOT.

Out of this total, 67.48% complied and the remaining 32.52% missed the assigned time due to events mainly related to the airline or interfacility coordination failures, airspace saturation, and airport infrastructure limitations. (See table 1 and graph 1).

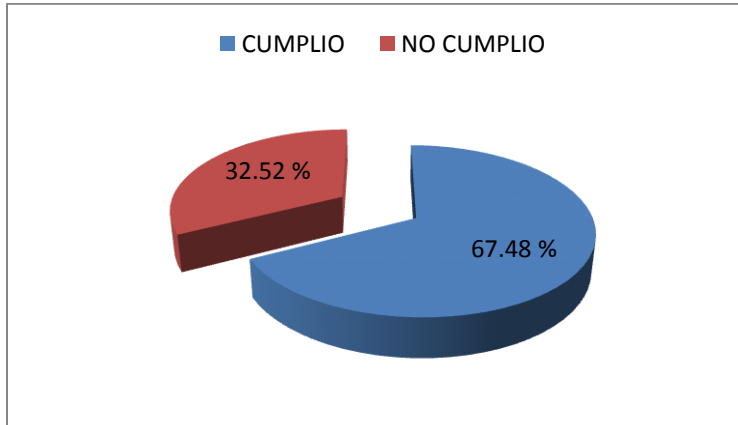
Table 1.- Compliance with the CTOT during the daytime shift

	TOTAL DE VUELOS	SIN TMI (CTOT)	CON CTOT	CUMPLIO				NO CUMPLIO	
				CTOT 1	CTOT 2	CTOT 3	TOTAL	%	%
TURNO MAÑANA	3256	1260	1996	1347	574	76	650	67.48	32.52

* Data from the Lima FMP, prepared by the DGAC ATFM team

Note 2.- CTOT 1 is the first calculated take-off time assigned by the Lima FMP to traffic foreseen to arrive at AIJCH in order to maintain the arrival acceptance rate. CTOT 2 is the second calculated take-off time assigned by the Lima FMP to aircraft that missed their departure turn in CTOT 1. CTOT 3 is the third calculated take-off time assigned to aircraft that missed their last time slot.

Graph 1.- Percentage of compliance with the CTOT – daytime shift



1.2. Nighttime shift: 2200-0300 UTC

A sample of 3603 flights conducted during the Lima FMP operating hours was taken, out of which 2559 flights were subject to a CTOT.

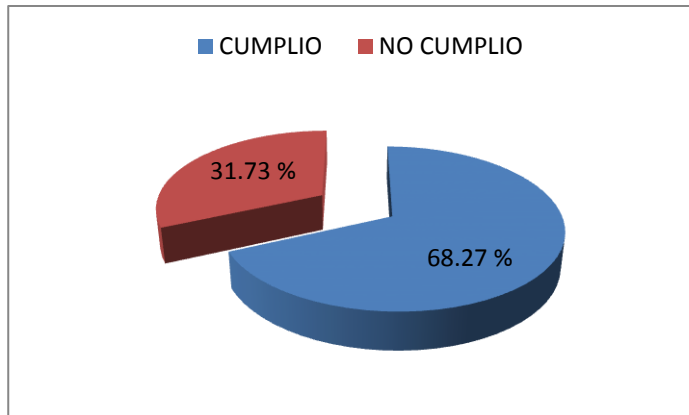
Out of this total, 68.27% complied, and the remaining 31.63% missed the time assigned due to events mainly related to the airline. (See table 2 and graph 2)

Table 2.- Compliance with the CTOT during the nighttime shift

	TOTAL DE VUELOS	SIN TMI (CTOT)	CON CTOT	CUMPLIO				NO CUMPLIO	
				CTOT 1	CTOT 2	CTOT 3	TOTAL	CUMPLIO %	NO CUMPLIO %
TURNO NOCHE	3603	1044	2559	1747	736	76	812	68.27	31.73

** Data from the Lima FMP, developed by the DGAC ATFM team*

Graph 2.- Percentage of compliance with the CTOT – Nighttime shift



1.3. Delay due to non-compliance with the CTOT

When the assigned departure slot is missed, it generates delays for aircraft. However, it is better to absorb the delay on ground instead of in the air, due to fuel consumption, environmental impacts, and airspace saturation.

Table 3 shows the average delay in flights that did not comply with the assigned CTOT.

- Daytime shift: Average delay CTOT 2 of 10 minutes and CTOT 3 of 17 minutes
- Nighttime shift: Average delay CTOT 2 of 10 minutes and CTOT 3 of 15 minutes

Table 3.- Average delay due to non-compliance with the CTOT

SHIFT	NEW CTOT	AVERAGE DELAY
MORNING	CTOT 2	00:10:17
	CTOT 3	00:17:22
NIGHT	CTOT 2	00:10:52
	CTOT 3	00:15:15

** Data from the Lima FMP, developed by the DGAC ATFM team*

III. APPLICATION OF THE SHORT-TOW PROCEDURE

STRATEGIC OBJECTIVE		
Reduce tow time and improve apron usage at AIJCH		
PERFORMANCE DIRECTIVE	PERFORMANCE INDICATOR	PERFORMANCE MEASUREMENT
REDUCE DEPARTURE TOW TIME	TOW TIME, IN ACCORDANCE WITH AIRPORT AREA	COMPARE CONVENTIONAL AND SHORT TOW TIMES

1. Compare conventional and short tow times

The average time of a short tow is 7 minutes and the average time of a conventional tow is 12 minutes, a saving of 39% in tow time.

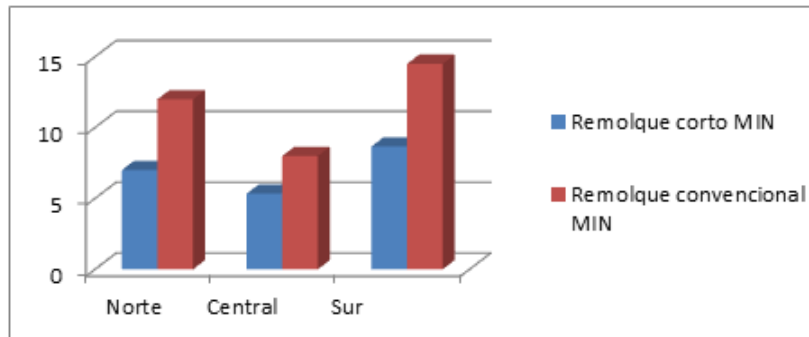
Table 1 shows average apron occupancy time for towing manoeuvres, according to apron sector used. Graph 1 shows the level of optimisation that can be obtained in apron occupancy time with the short tow.

Table 1.- Average reduction in tow manoeuvring times

	Norte	Central	Sur	TOTAL
Remolque corto MIN	7	5	9	7
Remolque convencional MIN	12	8	15	12
Diferencia en minutos	5	3	6	5
Reducción en porcentaje	42%	33%	40%	39%

** Data from LAP, developed by the DGAC ATFM team*

Graph 1.- Comparison between short tow and conventional tow, in minutes



** Data from LAP, prepared by the DGAC ATFM team*