PUBLICVERSION

South Africa Airside Capacity Enhancement Study for Air Traffic Navigation Services

Task 1 Report: Kickoff Meeting, Work Plan, Document Review, Site Visits

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ACKNOWLEDGEMENTS

The Metron Aviation Team wishes to thank all of the dedicated men and women at the Air Traffic and Navigation Services Company of South Africa and the Airports Company of South Africa for the time and effort provided in support of this effort.

LIST OF ACRONYMS

AAR .... Airport Arrival Rate
AASA .... Airlines Association of Southern Africa
ACE .... Airside Capacity Enhancement
ACSA .... Airports Company South Africa
ADR .... Airport Departure Rate
AFP .... Airspace Flow Program
AFT .... Airspace Flow Tool
AMAN .... Arrival Management
AMC .... Airport Management Centre
ANSP .... Air Navigation Service Provider
ATC .... Air Traffic Control
ATCC .... Air Traffic Control Centre
ATCT .... Airport Traffic Control Tower
ATFM .... Air Traffic Flow Management
ATM .... Air Traffic Management
ATNS .... Air Traffic and Navigation Services
AVGAS .... Aviation Gas
CAA .... Civil Aviation Authority
CAMU .... Central Airspace Management Unit
CAT .... Clear Air Turbulence
CDM .... Collaborative Decision Making
CEO .... Chief Executive Officer
CFO .... Chief Financial Officer
CNS .... Communications, Navigation and Surveillance
CTOT .... Calculated Take Off Time
OMDB .... Dubai International Airport
FAA .... Federal Aviation Administration
FABL .... Bloemfontein Airport
FACA .... Cape Town FIR
FAD .... South Africa Danger Area
FAEL .... East London Airport

FAGC .... Grand Central Airport

FAGM .... Rand Airport

FAJA .... Johannesburg FIR

FAJO .... Johannesburg Oceanic FIR

FAJS .... O. R. Tambo International Airport

FAKN .... Kruger Mpumalanga International Airport

FALA .... Lanseria International Airport

FALW.................. Langebaanweg Airport

FALE .... King Shaka International Airport

FAP...................... South Africa Prohibited Area

FAPE .... Port Elizabeth Airport

FAPM .... Pietermaritzburg Airport

FAR……………..South Africa Restricted Area

FARB .... Richards Bay Airport

FASK................... Airport Swartkops Air Force Base

FAVG .... Virginia Airport

FAWB .... Wonderboom Airport

FAWK .... Waterkloof Air Force Base Airport

FAYP................... Ysterplaat Airport

FBO .... Fixed Base Operator

FIFA .... Fédération Internationale de Football Association

FIR....................... Flight Information Region

FL .... Flight Level

FUA .... Flexible Use of Airspace

GIS .... Geographic Information System

FAGG .... George Airport

GSE .... Ground Support Equipment

IATA .... International Air Transport Association

ICAO .... International Civil Aviation Organization

IFR....................... Instrument Flight Rules

ILS .... Instrument Landing System

INM .... Integrated Noise Model

KMZ .... Keyhole Markup Language, Zipped

LCC .... Low-Cost Carrier

FLLS.................... Kenneth Kaunda International Airport

FQMA .... Maputo International Airport

OAG .... Official Airline Guide

PBN .... Performance-Based Navigation

RAS .... Remote Apron Stands

REDIM .... Runway Exit Design Interactive Model

RET .... Rapid Exit Taxiway

RFP...................... Request for Proposal

RNAV.................. Area Navigation

ROT..................... Runway Occupancy Time

RPZ...................... Runway Protection Zone

SAA..................... South Africa Airlines

SIDS .... Standard Instrument Departures

SSI .... Station Standing Instruction

STAR................... Standard Terminal Arrival Route

TAAM .... Total Airspace and Airport Modeller

TMI...................... Traffic Management Initiative

USTDA................ U.S. Trade and Development Agency

VFR .... Visual Flight Rules

VOR .... VHF Omnidirectional Range

1 Executive Summary

Air Traffic and Navigation Services (ATNS) and Airports Company South Africa (ACSA) have engaged Metron Aviation, Landrum & Brown, and ACA Associates to conduct a South Africa Airside Capacity Enhancement Study (SA ACES). The purpose of the study is to identify and validate capacity enhancing technologies and procedural improvements that lead to reduced delays and increased efficiency and safety of air traffic movements at the Cape Town, King Shaka (Durban) and O. R. Tambo (Johannesburg) international airports. This study is funded by the U.S. Trade and Development Agency (USTDA).

The study started with a kickoff meeting during October 2012. The purpose of the meeting was to engage ATNS and ACSA, and to get confirmation of their objectives for this study. The Metron Team successfully aggregated these objectives into the following: evaluate the feasibility of utilising capacity enhancements, identify capacity enhancements, prioritise various criteria, identify efficiency gains by capability, identify trigger points for installing new capacity, and develop a joint ATNS-ACSA roadmap for capacity gains.

Another outcome of the kickoff meeting was to refine and re-scope the eight remaining tasks that comprise the SA ACES. These tasks include identifying efficiency gains associated with each capability, understanding the regulatory framework in which ATNS and ACSA operate, conducting a preliminary environmental impact assessment, proposing a set of capacity enhancements, and developing a comprehensive implementation plan. These tasks may be further refined as the study progresses. The participants at the kickoff meeting developed a preliminary work plan that lists the tasks and associated start and end dates.

After the kickoff meeting, the Metron Team visited O.R. Tambo, King Shaka, and Cape Town International airports. They also visited the Central Airspace Management Unit (CAMU) and the Airport Management Centre. The team observed on-going operations, captured input from ATNS and ACSA experts, reviewed documentation, and gained an understanding of the facilities' current and forecast future operating environments. During these visits, the Metron Team identified each facility's demand characteristics, airspace characteristics, and the primary surface, departure, and arrival procedures. These observations will serve as the starting point for identifying airspace capacity enhancements. In addition, ACSA arranged meetings with planners for the local municipalities to discuss the potential relationship of capacity enhancements on the airport vicinities.

The Metron Team also participated in joint ATNS-ACSA meetings that explored the financial and procurement environments in which both organisations operate. The discussions during those meetings revealed the differing nature of those environments. These differences are partially due to varying ownership structures, investment timelines, and mandates from the national government. Complicating this picture are the airline operators, each of which pursues a different business objective. All participants in these meetings realised that there are certain organizational inefficiencies within ATNS and ACSA that may impact the implementation of certain capacity enhancement capabilities; there are already efforts within these organisations as well as within the Ministry of Transport to address these inefficiencies. As a result, the Metron Team will conduct its procurement review using the regulations that will be in effect at the end of 2012.

During and subsequent to the October meetings, ATNS and ACSA provided the Metron Team with critical documentation pertaining to airspace and airport operations. The artefacts include maps, radar data, models, standard operating procedures, noise contours, drawings, and governmental regulations and reports. This documentation will substantially contribute to the success of this study.

The Metron Team's recommendations will include improvements identified by the ATNS/ACSA Airside Capacity Enhancement Initiatives list, as well as those observed directly by the team during the site visits. Subsequent analyses will include the identification of capacity shortfalls and metrics, analysis of weather, historical and forecast traffic activity, examination of capacity enhancements and their impacts, and the development of models to assess their benefits.

This report describes the results of the activities associated with Task 1: Kickoff Meeting, Work Plan, Document Review, and Site Visits. Task 1, the first of nine tasks, serves as the foundation for all subsequent tasks under the SA ACES. The objectives of this task are as follows:

1. Establish working relationships with ATNS, ACSA, and other stakeholders.

2. Gather relevant airside and airspace data and information, and gain an understanding of current and future operations for use in future tasks.

3. Gain support for the initial plan and proposed methodologies for future tasks.

While this material is presented in separate sections as a means to facilitate the presentation and organisation of the topics, the team recognises that issues related to demand and to airport and airspace capacity are intrinsically linked and dependent on one another. As such, the team has endeavoured to highlight those issues of interdependency between airspace and airport operations throughout this report, for each of the three study airports.

The Metron Team supplies this report with the expectation that ATNS and ACSA will review and respond to ensure that the information is factual and forms the basis of continued collaboration. Such a review will ensure a comprehensive report at the end of the study.

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2 Overview of ATNS and ACSA

This chapter discusses ATNS and ACSA, the two organisations responsible for air traffic management and airport management within South Africa.

2.1 ATNS

ATNS is a public company responsible for air traffic control, aeronautical information, search and rescue activities and provision of communication, navigation and surveillance infrastructure in South Africa. It falls under the control of the Department of Transportation and Minister of Transport, and is led by its Acting CEO Thabani Mthiyane. ATNS is subdivided into several smaller business units as illustrated in Figure 1.

During its October visit, the Metron Team participated in meetings with personnel from each of the four smaller units—mostly within the Operations unit. This unit of ATNS consists of the Cape Town and Johannesburg Flight Information Regions (FIR) and the associated airspaces relevant for the study: O.R. Tambo (FAJS), King Shaka (FALE), and Cape Town (FACT) International Airports. Chapters 3–5 summarise the discussions of those meetings.

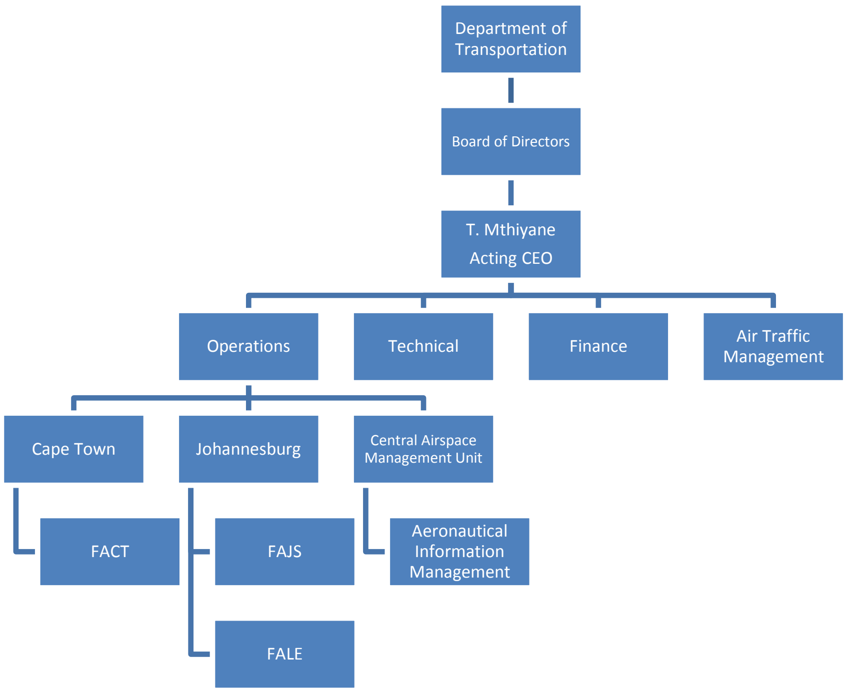


Figure 1: ATNS Organisation & FIRs

2.2 ACSA

ACSA is responsible for the planning, operations, and management of South Africa's nine principal airports, including FAJS, FALE, and FACT. ACSA is owned by a variety of entities. A summary of shareholders from the ACSA Director's Report (for the year ended 31 March 2012) is provided in Table 1. ADR International Airports SA (PTY) Ltd is a wholly owned subsidiary of Public Investment Corp SOC Ltd. It is responsible for the managing the assets of the Government Employees' Pension Fund. The Empowerment Investors is actually a group of individual investors whose total investment adds up to 4.2%.

Table 1: ACSA Shareholders

Owner	% Ownership
South African Government – National Department of Transport	74.6%
ADR International Airports SA (PTY) Ltd	20.0%
Staff Share Incentive Schemes	1.2%
Empowerment Investors	4.2%

ACSA's acting Managing Director is Bongani Maseko. The organisation is subdivided into four distinct business units as shown in Figure 2.

Figure 2: ACSA Business Units

3 Kickoff Meeting & Work Plan

This chapter describes the kickoff meeting and work plan.

3.1 Kickoff

The kickoff meeting was held at the ATNS Head Office[1] on Monday, 1 October 2012. The meeting was well-attended by ATNS, ACSA participants representing each airport, and the Metron Team consisting of Metron Aviation, Landrum & Brown, and ACA Associates.

The purpose of the kickoff meeting was to engage ATNS and ACSA and get confirmation of their objectives for this study. The Metron Team spent time reviewing each task with the group to gain consensus on the overall objective. ATNS and ACSA stressed the importance of studying a broad spectrum of technologies and procedures, current and future. Current technologies and procedures should not be disregarded for new ones, as the current items may still provide capacity enhancements if applied differently. Therefore, ATNS and ACSA requested that the team look for improvements to existing capabilities before investigating new capabilities.

ATNS and ACSA agreed that only airside operations are of interest. For the purposes of this study, airside continues from the gates to the airspace. Landside operations are out of scope. The study requires exploring capacity enhancements on the surface and in the airspace. The enhancements will be different for each airport. There is no "one size fits all" solution.

Additionally, ATNS and ACSA suggested that the study team meet with aircraft operators to ensure that the team captures their inputs. ATNS and ACSA agreed to assist the Metron Team with the planning of these meetings. Messrs Matshoba and Hawke will coordinate with Mr Ratcliffe. Discussions with aircraft operators will provide further insight into the operational challenges and successes they experience.

ATNS and ACSA request a joint roadmap of prioritised capabilities that considers the combined goals and objectives of the entire aviation industry. The roadmap will also consider a mixed fleet of aircraft in order to accurately reflect current and future operations. It is the intentions of ATNS and ACSA to eventually share the roadmap with the relevant stakeholders in the aviation community.

3.2 Objectives Defined during the Kickoff Meeting

The specific objectives of the study were discussed and modified to read as follows:

- Evaluate the feasibility of utilising capacity enhancements for the following:
  - Airspace
  - Airside

[1] Eastgate Office Park, Block C, South Boulevard Road, Bruma 2198 Gauteng, Republic of South Africa

- Prioritise capacity enhancements, taking the following into consideration:
  - Existing and advanced technologies and procedural improvements
  - Infrastructure improvements
  - Training
  - Aircraft operator avionics and performance
- Identify efficiency gains for identified improvement
- Identify trigger points for initiating capacity enhancement initiatives
- Develop a joint ATNS-ACSA roadmap of prioritised capabilities

The objectives of the individual tasks were reviewed by the attendees, and clarifications were provided as needed.

The kickoff meeting attendees and the organisation for which they work are listed in Table 2.

Table 2: Kickoff Meeting Attendees

First	Last	Organisation
Yazeed	Abrahams	ACSA
Chris	Ermatinger	Metron Aviation
Sanjeev	Gareeb	ACSA
Carel	Gersbach	ATNS
Doug	Goldberg	Landrum & Brown
Howard	Hawke	ATNS
Adele	Klingenberg	ACSA
Erik	Kriel	ACSA
Taryn	Lewis	Metron Aviation
Josia	Manyakoana	ATNS
Peter	Marais	ATNS
Jeoff	Matshoba	ATNS
Ramesh	Motilal	ACSA
Sthembiso E.	Ngobese	ACSA
Stuart	Ratcliffe	Metron Aviation
Kris	Reddy	ACSA
Shaheed	Regal	ACSA
Hein	Reid	ATNS

First	Last	Organisation
Donald	Schenk	ACA Associates
Jennifer	Smith	ACSA
Sheila	Thomas	Landrum & Brown
Sonelle	van Voorst	ACSA
Justeyn	Van Zyl	ACSA

A copy of the final kickoff meeting slides is available in Appendix A.

3.3 Tasks Supporting the Objectives

After agreeing on objectives, the participants defined tasks to achieve those objectives. The following paragraphs summarise those tasks and the relevant discussions.

All present agreed on the overall objective of Task 1. The lead representatives from ATNS and ACSA stressed that the deliverable dates are acceptable for now, but they may not always be able to meet the Metron Team's feedback schedule as presented. Metron will confirm deliverable dates well in advance and make adjustments when required. Team Metron will expect feedback on the reports from ATNS and ACSA two weeks from the date of delivery. The study team will respond to all feedback by ensuring that it is incorporated into subsequent reports. Document Review tasks will be on-going, as requested documents are still being received at the time of this deliverable.

Task 2, Technical Analyses, includes an estimation of efficiency gains for each identified capability. It is important that these gains be quantified as much as possible. The results of this task should lead to a prioritised list of capabilities. This list may include aggregated capabilities if results show that the combination of capabilities bring greater benefits. Aggregation can be based on a variety of criteria, including short- or long-term, costs, services, etc. The prioritisation and aggregation should consider the 5–10 year business plan. The study team will help ATNS and ACSA establish appropriate metrics to monitor airport and airspace operations. Metrics examples include capacity, demand, peak hour, and delay.

The scope of Task 3, Economic and Financial Analysis, explores the regulatory framework governing the financial objectives of ATNS and ACSA that impact the selection of the capacity enhancing capabilities. ACSA Chief Airport Planner, Erik Kriel, and ATNS Senior Manager of ATM Planning, Howard Hawke, agreed to help set up meetings for Don Schenk of ACA Associates. These meetings are also directly related to Task 4, Institutional, Legal, Regulatory and Procurement Practices Review.

The objectives for Task 4 are now very similar to those for Task 3 such that the goal is to understand the laws and regulations that enable the identification of recommendations to promote increased competition among qualified suppliers for the selected capacity-enhancing capabilities.

Task 5, Preliminary Environmental Impact Assessment, includes a comprehensive list of the potential environmental effects of the recommended enhancements, but not a full-scale environmental analysis. The task will focus on both the positive and negative implications of the capacity-enhancing capabilities.

Task 6, Specifications and Recommendations, proposes a set of recommended capacity enhancements and the requirements for implementation. This report will include a description of the rules for aggregating the recommended capabilities.

The scope of Task 7, Development Impacts, has not been defined yet. In general, this task addresses the various implications of the recommended capabilities, if the final recommendations of this study are implemented. At this point, the participants conjectured that this task will include knowledge sharing (Total Airport and Airspace Modeller (TAAM) analysis, collaborative activities with ATNS & ACSA, etc.), internships, and other activities. ATNS and ACSA will give this task more thought, and additional discussions will take place at a later time.

For Task 8, Implementation Plan, ATNS and ACSA requested a comprehensive, flexible, and scalable plan of implementation. The ultimate result of this task will be a road map of enhancement initiatives derived from the results of Tasks 2–5. The plan needs to consider that new equipment technologies are typically purchased approximately two years before full procedural implementation. Any schedule that the Metron Team puts forth must relate to described trigger points that will inform ATNS and ACSA of the right time to initiate implementation. The implementation plan will include a list of specific actions. Possible implementation strategy categories include: Plans and Policies, Incentives, Procedures, Monitoring and Reporting, and Purchase of Services and Products.

The Final Report, Task 9, compiles the results from Tasks 1–8. The report will include customer feedback received throughout the period of performance. The Metron Team will conduct a final briefing of these results to ATNS and ACSA. Lastly, it is agreed that the actual date of delivery is open for discussion as the study comes to its conclusion. Based on the initial schedule, the Final Report is due the end of February, but it was requested that this be pushed into early March to account for the time lost during the South African holidays. This final date of delivery will be discussed at a later time.

3.4 Work Plan

The work plan illustrated in Figure 3 was reviewed and accepted as stated with a couple of minor points of interest. ATNS and ACSA will have two weeks from report delivery date to share the reports with all interested stakeholders, to review each report, and to provide consolidated feedback. The Metron Team will review the feedback and respond appropriately with an approximate date to deliver a detailed response. Each deliverable date will be reviewed with ATNS and ACSA in advance to ensure that the dates are practical for all involved.

The current plan is accepted as the baseline plan. The report deliverable dates are shown in red in Figure 3.

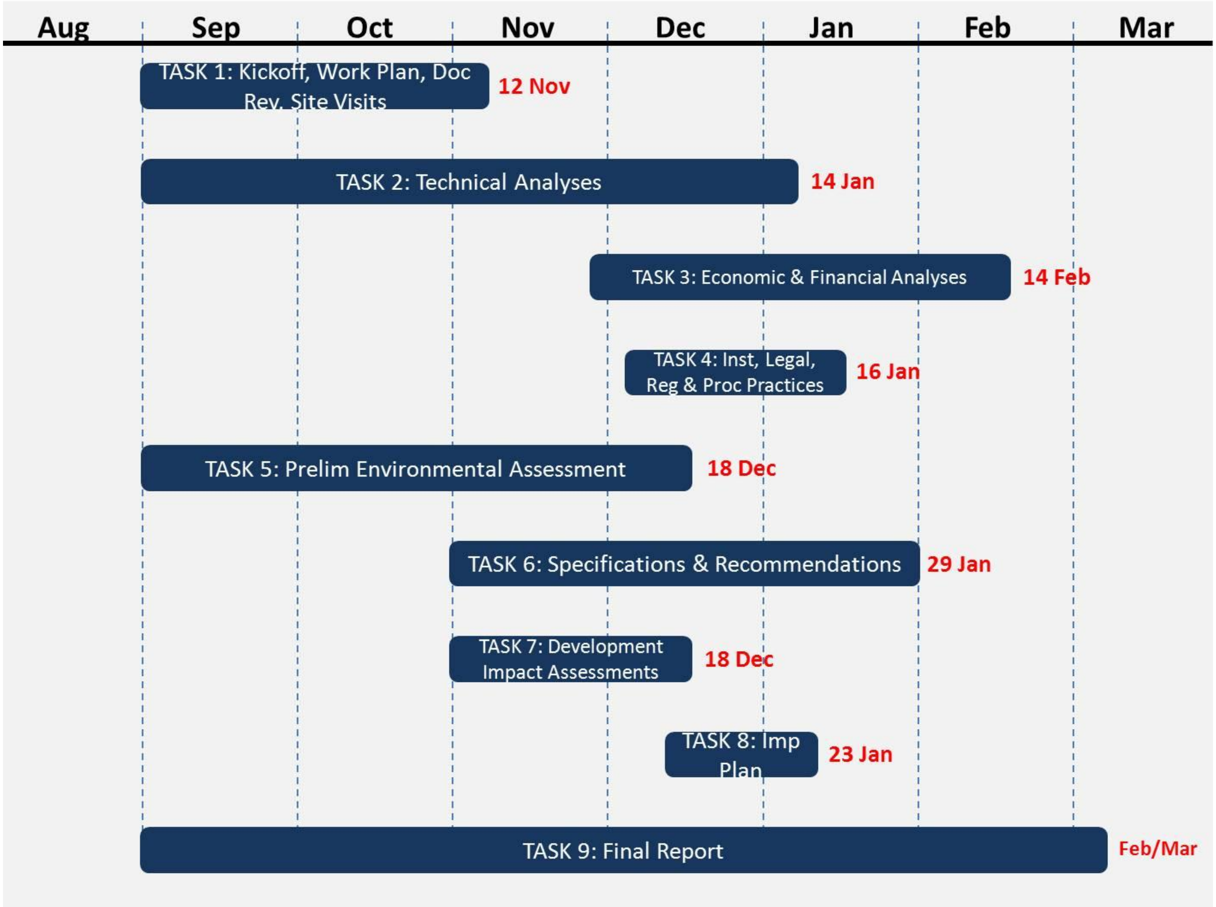


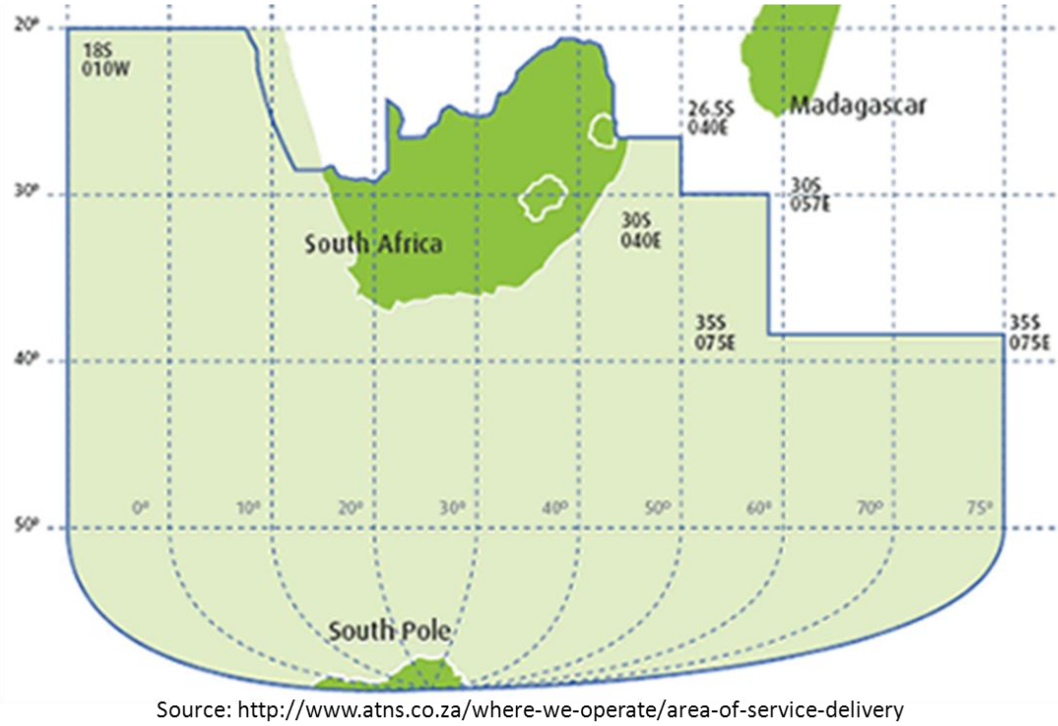
Figure 3: High-level work plan

4 Site Visits and Observations

The objective of the site surveys was to develop a deeper understanding of the operating parameters and issues through discussing and examining the current operations at the representative airports and the corresponding airspace in South Africa. The team spent considerable time in each of the O.R. Tambo, King Shaka, and Cape Town ATNS and ACSA facilities observing operations, listening to the experts from ATNS and ACSA, and reviewing available documents to understand the current and forecast future operating environment affecting performance and capacity at each airport. Although other airports are mentioned in this report, it is done so in describing their impacts on the representative airports.

4.1 South Africa Airspace Overview

ATNS is responsible for the airspace inside the blue border illustrated in Figure 4.



Source: http://www.atns.co.za/where-we-operate/area-of-service-delivery

Figure 4: ATNS SA Service Area

Figure 5 is a closer look at the airspace of South Africa. This image provides a general view of the location of the airports and airspace.

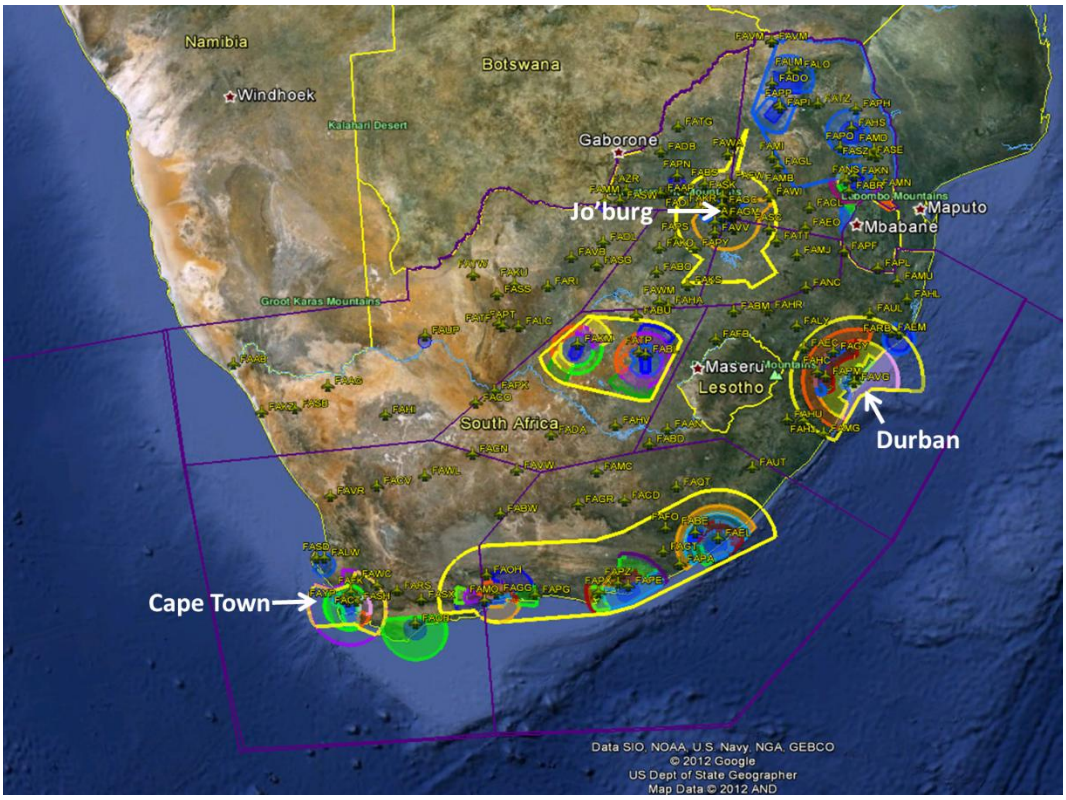


Figure 5: South African Airspace, Airports, and Surrounding Regions

ATNS is responsible for 11% of the world's airspace. The South African airspace is divided into three FIRs: Johannesburg FIR (FAJA), Johannesburg Oceanic FIR (FAJO) and Cape Town FIR (FACA). ATNS operates 21 aerodromes within South Africa. Terminal control is supplied at various airports either on-site or remotely. En-route area control services are supplied from Johannesburg Air Traffic Control Centre (ATCC) and Cape Town ATCC. It is significant that the entire airspace above Flight Level (FL) 200 is Class A; there is no restricted or prohibited airspace above FL 200. FAJS and FALE are contained within the Johannesburg FIR, and FACT is located in the Cape Town FIR.

Sections 4.2–4.5 provide an overview of the operations and challenges for each region. There is a brief overview of the meetings attended, followed by a more detailed discussion of the demand and operations in the airspace and the airports. ATNS and ACSA are co-located at each airport, so the site visits are organised by airport.

4.2 O R Tambo International Airport (FAJS)

This section describes the meetings and site visit observations conducted in Johannesburg, South Africa.

4.2.1 Meetings

The study team conducted site visits and meetings in Johannesburg with ATNS and ACSA during 1–5 October 2012. Participants also included the Airline Association of South Africa and the Ekurhuleni Municipality. The attendees are listed in Appendix C. The findings of these meetings are summarised in the following sections.

4.2.2 Demand Characteristics

The characteristics of demand have a profound effect on the capacity of an airport-airspace system. Accordingly, the sections below that focus on each of the three study airports include a brief summary of current demand characteristics. Demand is often measured in terms of annual air traffic movements or annual passengers, capacity is provided in smaller periods such as an hour or even smaller increments of time. Data provided during the meetings, in the background documentation, and historical activity statistics, provide detailed information about the timing and nature of daily and hourly operations for each airport. These databases will be evaluated in detail in the next task of this study as part of the assessment of various capacity enhancement initiatives.

For purposes of this initial report, the Metron Team conducted a preliminary assessment of publicly available scheduled activity obtained through the Official Airline Guide (OAG) for each of the airports, using a typical design day methodology to provide a preliminary indication of the key demand characteristics. It is noted that OAG data only includes scheduled commercial activity. This analysis will be refined in Task 2 to capture all activity at each airport (including non-scheduled flights) based on historical data provided by ACSA. The method for defining the design day will be refined in Task 2 based on further discussions with ACSA to properly capture the ATM peaking characteristics of demand. Some of the most relevant distributional characteristics of scheduled demand that influences capacity and performance, and therefore will be examined in Task 2, include the hourly profile, fleet mix, user mix, and origin and destination:

- Hourly Profile – the timing of scheduled arriving and departing flights throughout the day and even within each hour determines the volume of demand relative to available capacity, and as such, significantly influences the level of delay and congestion.

- Fleet Mix – the mix of aircraft influences many aspects of performance and capacity, including approach speeds, in-trail separation requirements, wake vortex separation, runway departure and arrival performance, avionic capability and others. The mix of aircraft by type (jet/turboprop/etc.) and by approach speed, design code and weight class is therefore a critical consideration in this analysis. Current operations indicate that demand for lighter aircraft (including general aviation) impacts the operational efficiency during peak operation periods.
- User Mix – the type of airline, as it relates to commercial passenger operations, cargo operations, or general aviation activity, influences contact/remote stand assignments at the airport, which in turns influences runway assignment and performance. (Given sensitivity about airline market share, information by airline will only be presented in aggregate)
- Origin/Destination Mix – the location of the origin for arrivals and the destination for departures influences the assignment by ATC of the terminal area arrival fix and the initial departure fix, which also influences runway assignment, particularly when ATC is applying a compass-mode runway assignment methodology. A clear understanding of existing and forecast demand by origin/destination, as well as by stage length and

whether the flight is domestic or international is an important consideration in assessing capacity enhancement opportunities.

Some of these characteristics are summarised in the remainder of this section based on a preliminary analysis of scheduled activity associated with a typical 2012 design day for each airport. In the next task of this study, a more detailed analysis of actual demand will be performed, which will include the impact of non-scheduled general aviation (GA) traffic. For airports such as Cape Town, with a substantial share of GA traffic, this segment of demand significantly impacts performance.

In addition to examining existing demand, the team will also explore the impact of forecast demand for each airport. Consideration of forecast demand will enable the team to define demand triggers that may influence the need for various capacity enhancement initiatives.

To provide a preliminary understanding of demand characteristics that influence performance and capacity, the team conducted an initial assessment of scheduled activity for a typical busy weekday in the peak month of 2012 at FAJS. June 15, 2012 was the design day selected for this preliminary analysis. On this day, a total of 552 commercial flights were scheduled for FAJS, as summarised in Table 3.

Table 3: FAJS 2012 Design Day Operations

Type of Flight	Domestic	Regional	International	Total
Passenger	302	104	135	541
Cargo	5	-	6	11
Total	307	104	141	552

The three categories in Table 3 are Domestic, representing domestic flights to and from other cities in South Africa; Regional, representing regional international flights to and from cities in Botswana, Lesotho, Malawi, Namibia, Swaziland, Zambia, and Zimbabwe; and International, representing all other international destinations.

Figure 6 plots the total number of arrivals and departures in five-minute buckets. The busiest period for scheduled arrivals recorded 27 movements, and the busiest period for scheduled departures had 30 movements. The busiest period for both scheduled arrivals and departures had 50 movements. The results also showed an early morning departure bank and consistent activity through the afternoon and early evening.

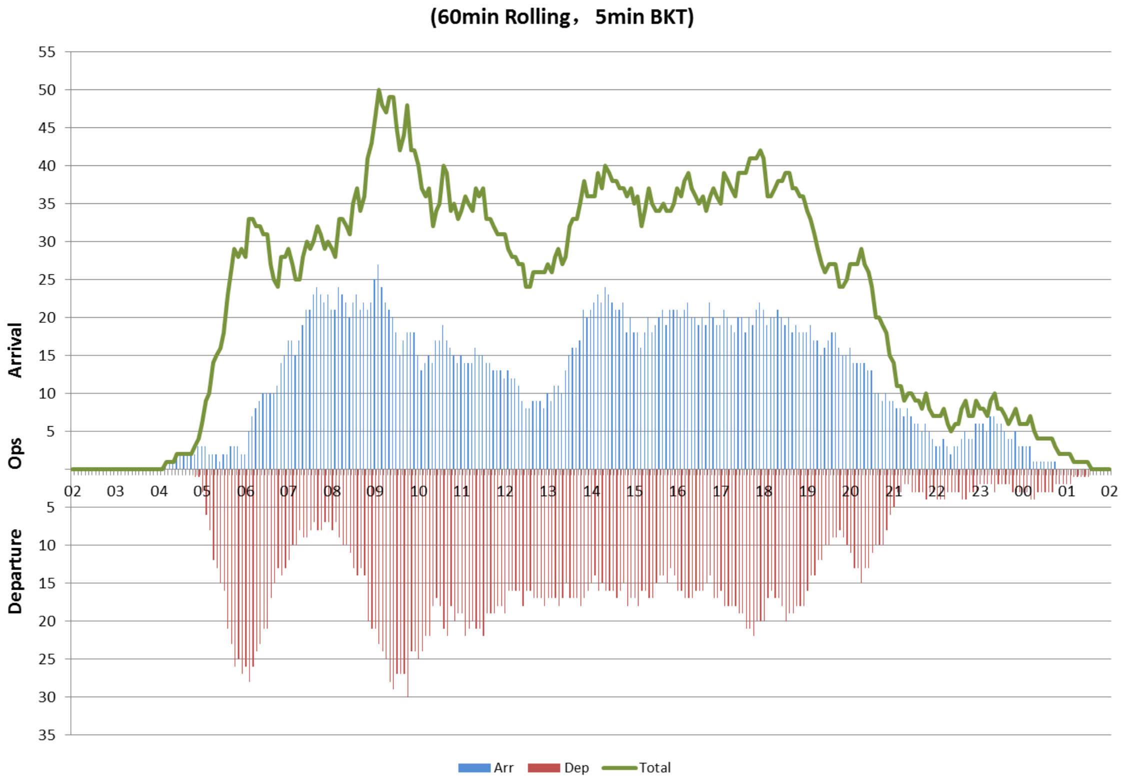


Figure 6: FAJS – Hourly Profile of Aircraft Movements 2012 Design Day Total

Preliminary analysis of the fleet mix for FAS (Figure 7) shows that the most common class of aircraft is Code C, with the B-737-800 being the most prevalent aircraft. As expected, less than 1% of flights are in the Code D class due to the eventual phase-out of this aircraft. The new Airbus A380 represents slightly more than 1% of the traffic, and of course has a major impact on capacity and performance. Code B aircraft includes the class of turbo-props and represents nearly a third of total activity. The variability in aircraft type, in terms of the weight class, associated equipment, and the ability to execute Area Navigation (RNAV) procedures, is a major consideration in this study. For a description of aircraft codes appearing in Figure 7, see Appendix D.)

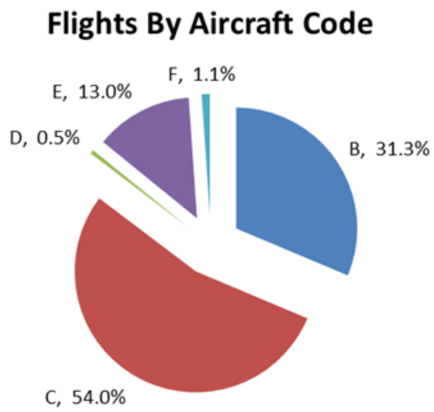


Figure 7: FAJS – Flights by Aircraft Code

South African Airways operates 56% of the scheduled activity at FAJS. British Airways has the next largest share of air traffic movements with 11%. There are as many as 38 other airlines serving the balance of demand, most of which serve less than 1% of total activity. Another component of demand is GA, corporate and traditional; this component is not included in the data presented in Table 4.

FAJS serves the largest number of destinations on the African continent, with over 89% of total air traffic movements to or from cities in Africa, as shown in Table 4: FAJS Origin-Destination Mix. Cape Town and Durban are the most heavily served destinations, with 17.9% and 13.4%, respectively. This distribution of origin and destination cities influences the assignment of flights to various Standard Instrument Departures (SID), Standard Terminal Arrival Routes (STAR), and runways, which in turn influences performance and the need for various capacity enhancement initiatives. The positive aspect of the high demand between FAJS, FALE, and FACT is that ATNS and ACSA can focus the management of these city pairs within their own organisations.

Table 4: FAJS Origin-Destination Mix

Rank	Continent	% of Operations
1	Africa	89.9%
2	Europe	4.5%
3	Middle East	2.0%
4	Asia/Pacific	2.0%
5	Latin America	0.9%
6	North America	0.7%

Finally, FAJS serves as the nation's primary gateway to the rest of the world, and functions as an important hub not only for the South African domestic market but also to regional destinations. It is the largest airport on the African continent in terms of annual passenger volumes, a ranking it has held for at least the last decade. Demand forecast analysis provided to the team by ACSA shows passenger volume at FAJS is projected to have an average growth rate of 4.94% from 2011 [18.6 Million Annual Passengers (MAP)] to 2035 (60.2

MAP). During later tasks of this study, the team will conduct further analysis of actual demand statistics provided by ACSA (including non-scheduled GA activity) to better understand the historical basis for these statistics and their implications for various capacity-enhancement initiatives. In the same time period, air traffic movements are forecast to increase from 212,918 to 610,767, for an average annual growth of 4.48%, based on aviation demand forecast prepared by Mott McDonald. Peak hour number of movements is projected to reach 90 in the year 2020.

4.2.3 Airspace

Johannesburg ATNS provides the following air traffic control (ATC) services: clearance delivery, ground movement control, aerodrome control, terminal control and en-route from the Johannesburg ATCC. The Johannesburg Terminal Control Area (TMA) (Figure 8) services FAJS and several other airports, including Rand (FAGM), Lanseria (FALA), Grand Central (FAGC), FAWB (Wonderboom), FASK (Swartkops military), FAWK (Waterkloof military), as well as various unmanned airports that are utilised for both Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) traffic. The TMA has an estimated capacity of 88 aircraft per hour as indicated by ATNS, of which FAJS holds the majority of the capacity at approximately 68%. The sum of capacities for all the aerodromes served by the TMA is far greater than 88; it is estimated to be in the vicinity of 110 aircraft per hour. The Metron Team was told that the FAJS en-route sectors were operating well below their capacity.

FAJS, a Level 3 coordinated airport, currently has a capacity of 60 movements per hour. A movement is defined as either an arrival or departure. Demand and capacity management attempts to manage a balance of 30 departures and 30 arrivals per hour irrespective of the peak hours and levels. This balance is first established through the issuance of airport slots through the World Scheduling Guidelines model as advocated by International Air Transport Association (IATA).

FAJS is a parallel-runway operated airport. The western runway, 03L/21R, is used for departures due to its closer proximity to the terminal building and for its length (14,000 feet compared to the eastern runway). The eastern runway, 03R/21L, is used for arrivals. Landing traffic will only be accommodated on the western runway in the following circumstances: emergencies, closure of eastern runway or feeding taxiways (single runway operations), crossing of slow towing aircraft, conducting runway inspection on eastern runway and when approach requests the use of the Western Runway due to operational constraints. Runway 03L/21R was observed to be used for arrivals when lulls in departure demand allowed.

The SIDS and STARS are illustrated in Figure 9 and Figure 10.

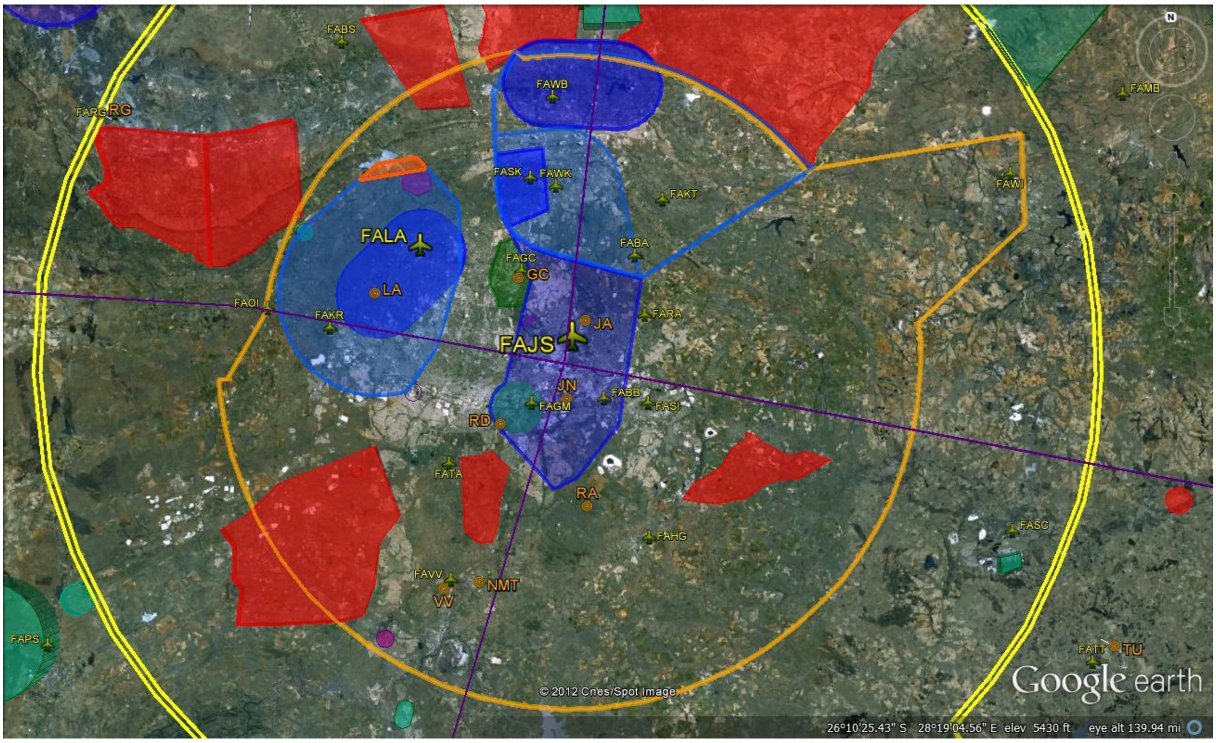


Figure 8: FAJS Airspace

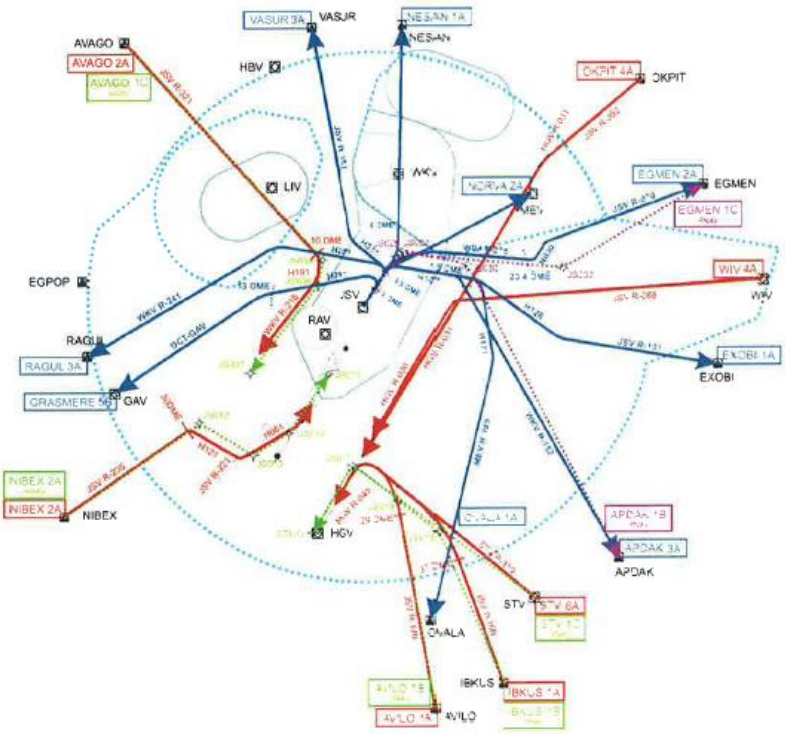


Figure 9: Runway 03 SIDS and STARS

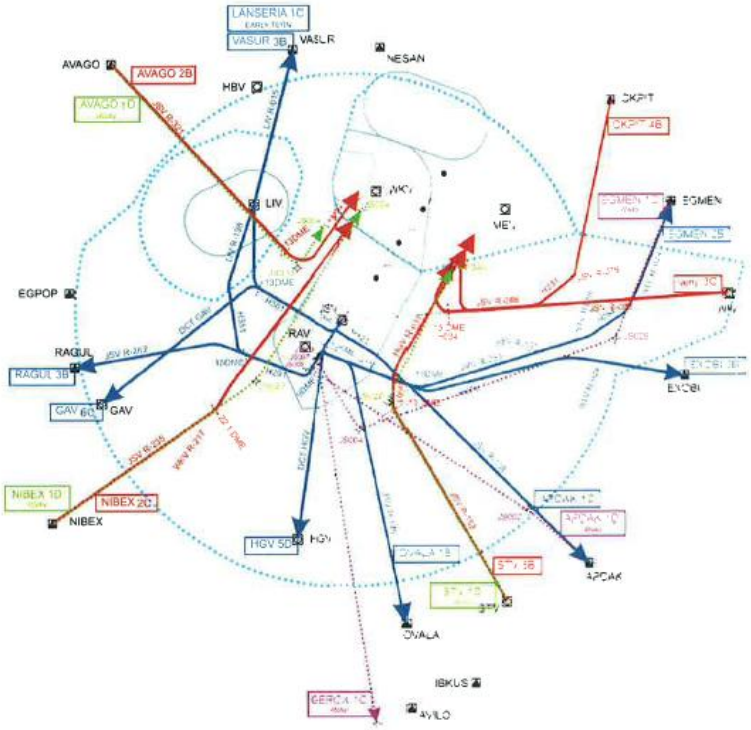


Figure 10: Runway 21 SIDS and STARS

During our discussions, several challenges were identified that impact the ability of ATNS to increase capacity utilization for operations at FAJS. The challenges are grouped into seven major areas, which are described next.

4.2.3.1 Terminal Area operations affecting FAJS

As previously stated, traffic to and from FAJS is controlled by the FAJS TMA controllers who are also responsible for controlling IFR traffic into and out of many airports that are situated below the FAJS TMA. The FAJS TMA has a capacity of 88 flights per hour as supplied by ATNS. FALA, a privately owned airport situated west of FAJS, has a growing demand of both non-scheduled and scheduled traffic. Traffic into FALA is presently separated using procedural control by ATC at FALA. It is common to have separations into FALA increase from a common 10NM (ten nautical miles), which is roughly three minutes, into a separation requiring ten minutes (or more) between arriving flights when they are required to carry out an instrument approach. This is as a result of the procedural environment at FALA. To expedite traffic into FALA, the terminal controllers at FAJS vector traffic for the ILS at FALA when traffic conditions and levels allow.

As the airborne inventory of flights for FALA grows, the TMA can be congested and at times saturated. ATC manages this in one of two ways:

- ATC places traffic bound for FALA into holding patterns, or they restrict departures out of FALA or other satellite aerodromes.

- The CAMU reduces the FAJS Airport Arrival Rate (ARR) or Airport Departure Rate (ADR) from 60 to a level that will relieve airborne congestion by delaying flights bound for or departing out of FAJS and thereby rebalancing the TMA capacity. In this case, the airport capacity of FAJS is sacrificed to rebalance the capacity of the TMA. In a new demand and capacity management initiative (commenced 1 October 2012), a Traffic Management Initiative (TMI) will be applied to arriving traffic into FALA between 1400 Z and 1700 Z daily.

Aircraft departing Runway 03L and Runway 21R are required to fly on runway heading for a distance of 4NM and 8NM (due to proximity of FAGM in the case of Runway 21R departures), respectively, as a result of noise abatement (with the exception of the Grasmere departure and FALA departures that are restricted to turbo-props). Adding to this, traffic may only turn off the SID once they have passed through FL 85 during the day and FL 100 at night. This limits the departure efficiency, as a fast aircraft following a slow aircraft is delayed by up to 5 minutes to effect the correct separation.

Adding to the complexity in the FAJS TMA are the following:

- Restrictions related to the military airports and airspaces within the vicinity of the FAJS TMA (FAWK and FASK)
- Parachute drop zones at FAWK, FASK, FAWB, and Carltonville. The Carltonville drop zone, when active, particularly interferes with arrivals and departures into FALA, causing extra liaison and alternate routings.
- IFR traffic arriving and departing out of FAWK, FASK, FAGM, FAGC and FAWB. All these airfields with the exception of FAWK are procedural environments.
- When active, the gliding area west of FALA (Magalies Gliding window) restricts arrivals and departures to/from FALA.
- Aerobatic boxes at Baragwanath and Vereniging.
- Aerial survey traffic.
- Fog conditions in winter and severe thunderstorm activity in summer.
- Conservative low visibility procedures.

4.2.3.2 Current capacity management practices

Demand and capacity management at FAJS is currently managed via TMIs on a 24-hour basis by the CAMU using the Metron Aviation AFT. This means that every flight either departing or arriving at FAJS is managed by the issuance of a Calculated Take Off Time (CTOT). The AFT assigns runway usage times for departures by their schedule should there be required capacity. In general discussions with various parties it was seen that there is a lack of understanding by stakeholders regarding slot allocation procedures; for example, ACSA personnel were not aware that an ATC slot takes precedence over an airport slot. The Metron Team also learned from discussions that the published schedule time is sometimes incompatible with the issued airport slot. This occurs as a result of the aircraft operator not acquiring the required airport slot, agreeing to the slot as issued by the coordinator but not amending its schedule or departure time. The AFT schedule does not take into account the necessary wake turbulence separation requirements between successive departures. For example, the AFT may schedule a heavy aircraft (e.g., Airbus 340-600) after a turboprop (e.g., Bombardier Dash 8), which requires a separation for this departing pair larger than the minimum CTOT separation of two minutes. Strict adherence to CTOT restricts the controllers' ability to tactically manage their traffic for efficient departure flows. The ATC specialists stated that it would help if the AFT-allocated slots were based on direction of turn after take-off, such as sequencing one right turn out followed by a left turn. The arrival management (AMAN) tool, Maestro, used by the controllers in the TMA is not integrated with the arrival times issued by the AFT. Assigned arrival times through AFT are not reflected in Maestro.

4.2.3.3 Fleet mix operational challenges

There are no restrictions on type of aircraft operating into and out of FAJS; this results in a high level of mixed aircraft type operations. The majority are medium-wake category aircraft; however there are light and heavy aircraft operating at the airport, including three A380s daily. The mixture of aircraft types poses separation and sequencing challenges for ATC.

The number of GA traffic departing, arriving, and transitioning through FAJS airspace contributes to congestion. As the FAJS aerodrome is in the middle of a residential and industrial area, and the TMA covers the entire Johannesburg/Pretoria metropolis, there is a high demand for aerial surveys resulting in added congestion.

4.2.3.4 Fleet equipage and procedures

The Metron team was told approximately 20% of the aircraft using FAJS are not equipped to perform RNAV and Performance-Based Navigation (PBN) procedures. Increasing the amount of traffic to an appropriate RNAV equipage will allow for more precise routing into and out of FAJS. The added precision can enable the use of dual independent approaches to the parallel runways, which will increase capacity for arrivals when there is a lull in departures. Equipage of aircraft will need to be complemented by additional procedures and training for duel runway operations; in addition, procedures will need to be revised for missed and staggered approaches once the equipage level of the fleet is high enough to enable dual independent approaches.

4.2.3.5 Staffing constraints

Currently, FAJS ATCC has a staffing of one-to-one controller-to-sector ratio. This increases the workload on controllers, which could lead to inefficient operations. Staffing constraints also lead to combining of sectors resulting in reduced flows of traffic. As ATNS controllers are well trained and highly regarded throughout the world, they are sought after, resulting in many experienced staff members leaving South Africa to pursue careers elsewhere.

4.2.3.6 Lack of collaboration

There is a lack of a permanent tactical Flow Management position in the ATCC. When staff are available this role is carried out by controllers. Regardless, the level of experience in flow management at the ATCC limits the available set of TMIs that can be safely implemented. There is no coordination plan or proper facility available to allow liaison with the CAMU. The lack of a dedicated Flow Management position decreases consistency and increases workload in managing traffic.

4.2.3.7 Lack of shared radar data between bordering nations

As a result of no shared radar connectivity between South Africa and adjoining states, ATC in South Africa often does not have pre-warning of flights joining its airspace. This is of particular concern as often flight plans are not received for flights. This is most notable for Botswana to the north and Namibia to the west. The lack of shared radar feeds among the ANSPs impedes ATC to anticipate the actual en-route demand.

4.2.4 Airside

The meetings about key issues at FAJS clearly identified the importance of collaboration between ATNS and ACSA regarding the interface between airspace and airport operations. The issues and opportunities related to the airspace surrounding FAJS are directly linked to the infrastructure and related ATC procedures applied at the airport. This section provides an overview of the key issues, challenges, and opportunities identified for enhancing capacity and efficiency at FAJS based on discussions with both ATNS and ACSA regarding the airport ground operation.

The most significant issue affecting the capacity of FAJS is the runway layout and the location of the terminal precinct on the west side of the airport property. The 1,873-metre spacing between the two parallel runways is sufficient based on ICAO guidelines for dual simultaneous instrument approaches, but presently the two runways are operated interdependently of each other. The location of the terminal precinct on the west side of the runway complex is one of several factors that limit the ability to efficiently execute dual approaches, because every operation on Runway 03R/21L must cross Runway 03L/21R. Other factors that preclude the use of dual simultaneous approaches are the lack of established procedures (including missed approaches), airspace limitations, and the current volume of peak hour demand. Furthermore, the constrained taxiway geometry adjacent to the western terminal precinct, including the single parallel taxiway Alpha, further exacerbates operations by limiting the ability for air traffic controllers to efficiently manoeuvre aircraft.

Figure 11 illustrates the airfield layout of FAJS, and highlights some of the most critical issues influencing performance. The issues are discussed in the following sections.

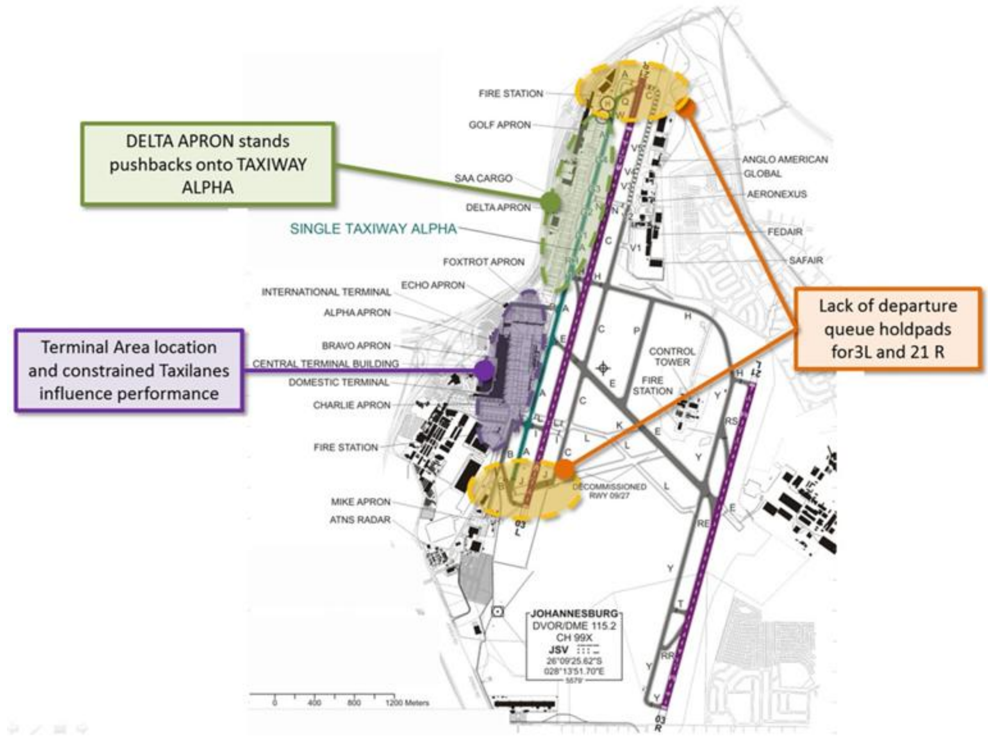


Figure 11: FAJS Airport Layout Issues

4.2.4.1 Runway Use/Procedures

In part due to the airfield geometry described above, and in part due to limited peak hour demand, the primary mode of runway operations is for aircraft to land on Runway 03R/21L, and for aircraft to depart on Runway 03L /21R. With current peak hour arrival or departure demand less than 30 movements per hour, there is limited incentive to warrant routine use of dual arrival or departure runways. Furthermore, because every aircraft landing on Runway 03R/21L must cross the inboard runway to reach the terminal area, consistent minimum in trail separation is therefore not always achieved.

The use of the inboard runway for departures is the most efficient mode of operation, given the current airfield geometry, because controllers can hold departures while arrivals taxi across runway 03L/21R. Arrivals are therefore sequenced to land on the outboard runway 03R/2lL, but require a long taxi distance, which increases both fuel burn and emissions. Occasionally, during periods of light departure demand, arrivals are directed to “side-step” from Runway 03R/21L to the inboard runway 03L/21R to reduce taxi distance. Runway 03L, as per Station Standing Instructions (SSI), is only to be used in exceptional cases, as long ROTs have led to missed approaches in the past. In addition, the lack of a dedicated airspace arrival route to runway 03L/21R limits the efficiency of assigning aircraft to the inboard runway from the arrival fix. As the practice of mixing arrivals on 03L/21R is at ATC discretion, Airlines Association of Southern Africa (AASA) expressed the perception of potential favouritism by ATNS that certain flights are given priority for this exception over others, though there is no evidence to support this claim.

While these issues apply during both north and south flow operations, ATC specialists acknowledge the impact of those issues is different for north and south flows. This difference is due to airfield geometry and airspace considerations, as described in the following sections.

Based on the team's discussions with ATNS and ACSA specialists, along with observations from the ATCT, the team prepared Figure 12 and Figure 13 to illustrate the primary runway use configurations and related taxi flow patterns. These diagrams are presented herein for confirmation from ATNS and ACSA, and to help illustrate the operational flows of the airport under typical operating conditions.

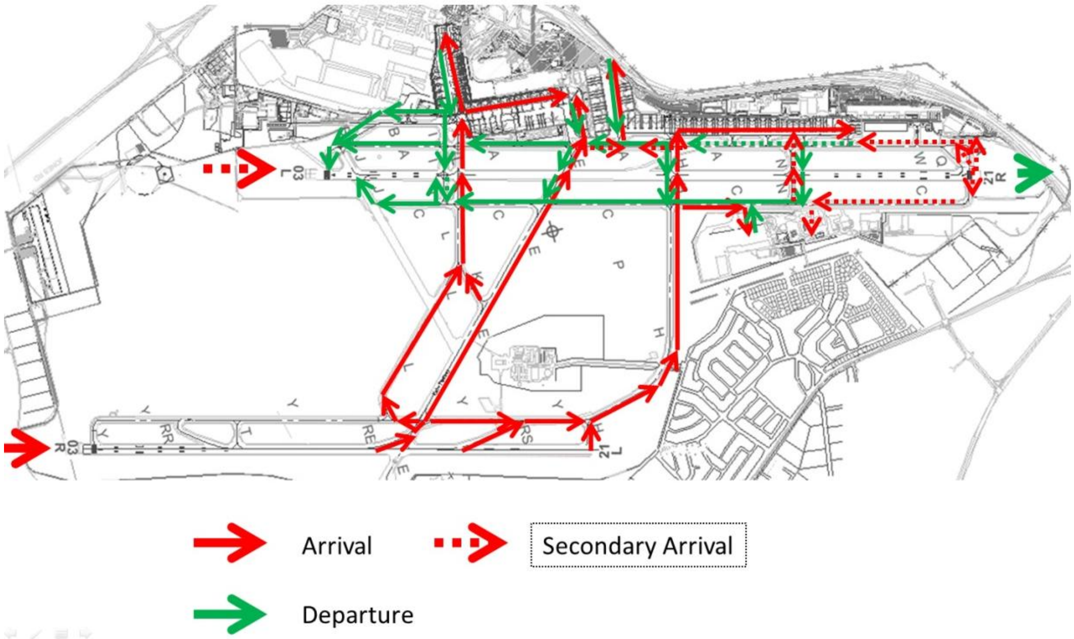


Figure 12: FAJS North Flow Operations

4.2.4.2 North Flow Operations

During north flow operations, the lack of adequate taxiway infrastructure near the end of Runway 03L limits the ability of ATC to optimise the sequence of departures. It is recognised that the development of a runway end hold pad near the end of Runway 03L would improve performance. Under current conditions, the sequence of departures on the runway should be established upon the issuance of pushback clearance from the gate. Typical variability in taxi times, airline operations, and terminal area congestion limit the efficiency of this operation.[2] The lack of a runway end hold pad makes it difficult for ATC to alternate east bound and west bound aircraft in the departure queue, and as a result, optimal performance is difficult to achieve.

4.2.4.3 Runway Crossing Procedures

ATC routinely uses taxiways Juliet, Lima, and Echo to stage aircraft arriving on Runway 03R to cross Runway 03L. When possible, ATC directs multiple aircraft to cross the inboard

[2] The Airside Capacity Enhancement Initiatives developed by ATNS and ACSA identified FAJS ref. No 1.6 "Holding Bays" as an Infrastructure Enhancement.

runway between successive departure gaps. However, congestion on Taxiway Alpha and potential interference with the 03L departure queue further limits the efficiency of the runway crossing procedures. Opportunities to improve the taxiway geometry on the west side of runway 03L would substantially enhance operational efficiency.

The single parallel taxiway Alpha also limits the use of the inboard Runway 03L for arrivals, because arrivals on 03L would experience head-to-head operations with aircraft pushing back from the remote stands. It may be possible under certain circumstances to use Taxiway C on the east side of the runway, but this would further increase the number of runway crossings.

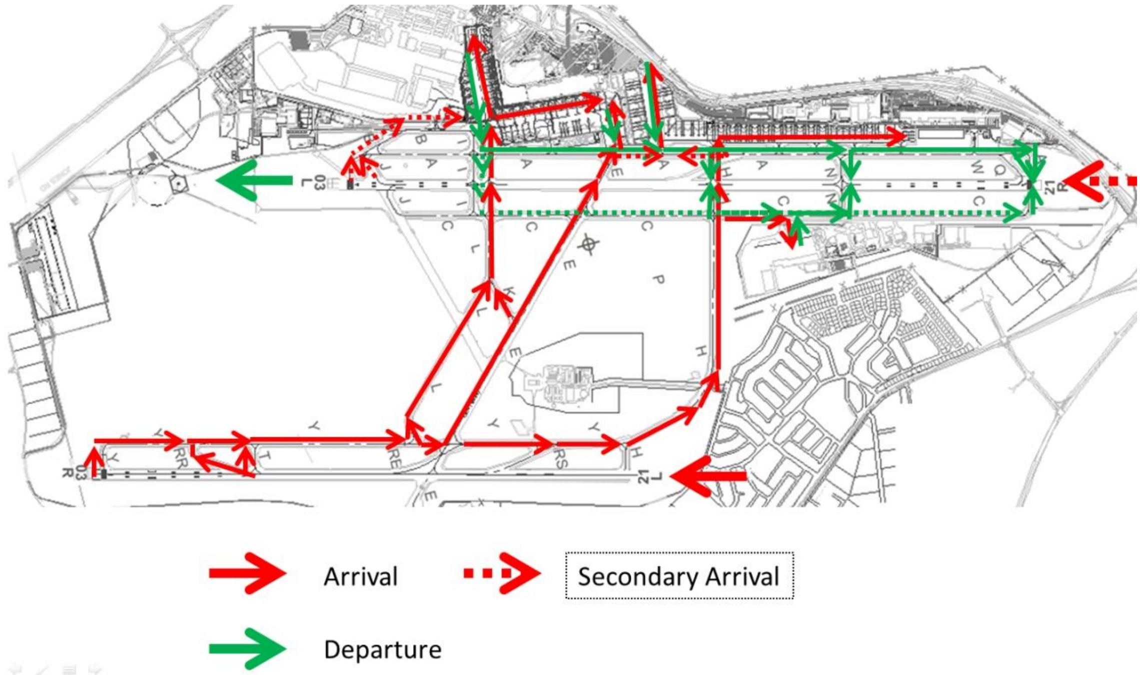


Figure 13: FAJS South Flow Operations

4.2.4.4 South Flow Operations

A major factor influencing the efficiency of operations when winds require the use of Runway 21L and 21R is the single parallel Taxiway Alpha and the lack of a pushback zone for aircraft using the remote stands for both cargo and passenger operations. Certain departures are often directed to execute intersection take-offs from Echo or Hotel, which helps minimise taxi times and limits the impact of aircraft pushback from the remote stands.[3]

4.2.4.5 Rapid Exit Taxiways

Through discussions with ATC specialists and observations from the ATCT, the current locations of Rapid Exit Taxiways (RET) on the arrival runways are not conducive to minimising Runway Occupancy Times (ROT), given the current fleet mix and operational

[3] The Airside Capacity Enhancement Initiatives developed by ATNS and ACSA identified ORTIA ref. No 1.5 "Bypass taxiway" as an Infrastructure Enhancement.

procedures.[4] Preliminary review of ROT data provided by ATNS/ACSA confirms that ROT is often well over 60 seconds per operation, based on measurement from the time aircraft cross the landing threshold to the time it clears the runway. Such ROTs are influenced by many factors, including but not limited to the location of RETs. Other factors such as congestion on the parallel taxiways, location of the assigned gate, aircraft fleet mix, temperature, elevation of airfield (high approach speeds) and performance capability also influence actual ROT. As part of this study, the team will apply the U.S. Federal Aviation Administration's (FAA) Runway Exit Design Interactive Model (REDIM) to help identify the optimal location for ROTs based on projected fleet mix and other operational criteria.

4.2.4.6 Master Plan Observations

The airport's long-term master plan contemplates the development of a new midfield terminal precinct between the dual parallel runways, and a set of close parallel runways on either side for a total of four runways. Such a configuration is consistent with many of the world's newly developed airports. However, the greatest challenge with this master plan is the extensive capital cost of relocating the terminal complex, landside infrastructure, and other related functions to enable an efficient, traditional airport layout with the terminals and landside facilities located between a set of closely spaced parallel runways. While this master plan may represent a reasonable long-term vision for the airport, it is important to identify a realistic phasing strategy that will enable the airport to efficiently serve demand through the foreseeable near-term while minimising environmental impacts and ensuring financial feasibility.

Toward this end, the following observations are noteworthy based on discussions with ACSA and ATNS regarding the operational challenges described throughout section 4.2.4. Each of these will be further developed during the course of this study.

- **Existing Terminal Infrastructure**—Because of the past investment in terminals, roadways and other related functions, ACSA is exploring ways to maintain efficient utilization of these facilities in the near- to medium-term. Furthermore, it is recognised that sufficient terminal and landside capacity remains available, particularly with further advances in passenger processing and baggage handling technology and current trends such as electronic ticketing. To that extent, an effort to focus on incremental airside infrastructure in the near-term will maximise use of the past investment in the existing terminal facilities.

- **Existing Two Runway Airfield**—Based on ICAO best practices, a two-runway system with a midfield terminal and an efficient taxiway system, can under normal circumstances serve 72 to 100 movements per hour, depending on the regional airspace configuration, demand characteristics, and many other factors. The specific operating environment that exists today at FAJS will not support this level of capacity without the implementation of improvements to the airport and the airspace system, and because of the airport's altitude and typical temperature. While current demand levels may not justify such improvements, forecast demand will continue to place pressure on the current airport system.

[4] The Airside Capacity Enhancement Initiatives developed by ATNS and ACSA identified ORTIA ref. No 1.4 "RET's and RAT's" as Infrastructure Enhancements.

- **Airfield Pavement**—The airport's primary capacity constraint appears to be based on the number and location of contact and remote stands, the taxiway layout, and the relationship between the terminal area and the airfield system. New apron and taxiway improvements that may be added as part of the Master Plan upgrades could be implemented in early phases to improve the operational balance between the existing terminal capacity and the aircraft movement area. In some cases, adjustments to the Master Plan layout could be recommended to better achieve near-term capacity while keeping capital investments consistent with long-term plans. This will be further reviewed during the technical analysis task.

- **Midfield Facility Development**—The potential to relocate a portion of the aircraft stands to the midfield creates an opportunity to reduce congestion in the current terminal core while also helping to offset the impact of runway crossings. This could occur through the use of remote hardstands in the midfield, such as those planned for the areas near the ATCT. These hardstands could be used either for long-stay aircraft holding to relieve contact stands for passenger processing, or, under certain conditions, for passenger loading and unloading. If the midfield stands are used for passenger processing, passengers would have to be transferred to the existing terminal core via a service road tunnel or a circuitous surface road around the end of Runway 03L/21R. The viability of this operation would have to weigh the issues of passenger level of service with airside operational efficiency.

With these issues and observations in mind, a number of airfield development scenarios may be worthy of consideration as interim steps toward the airport's long-term vision while also being sensitive to the economic realities of the current marketplace. While the long-term master plan provides for four runways, it is possible that a three-runway layout would provide a sufficient level of airside capacity through the foreseeable future, provided a number of other procedural and infrastructure improvements are implemented. While not in the Master Plan, it may be possible to build a closely-spaced parallel runway to Runway 03L/21R, while converting the existing runway 03L/21R to a taxiway, perhaps converting existing Taxiway Charlie to a runway on an interim basis. This would help alleviate the congestion caused by the single parallel taxiway Alpha, and facilitate the use of 03L/21R for arrivals. This may further create opportunities for additional near-term improvements to the taxiway layout in the existing terminal area, while also considering additional remote stands in the midfield to further enhance the airport's operating efficiency in the near- to mid-term, subject of course to viable demand triggers and improvements in economic conditions. While some facilities in the northeast cargo area may need to be relocated, depending on the location of the Runway 21 threshold and the Runway Protection Zone (RPZ), these relocations would be consistent with the ultimate Master Plan and would not result in lost investments.

4.3 King Shaka International Airport (FALE)

This section describes the meetings and site visit observations conducted in Durban, South Africa.

4.3.1 Meetings

The Metron Team conducted site visits and meetings with ATNS and ACSA 1 October 2012 and 8–10 October 2012. The team visited the ATNS and ACSA facilities at FALE, and met with the eThekwini Municipality, Umhlanga Town Planning consultant. The attendees are listed in Appendix C. The findings of these meetings are summarised in the following sections.

4.3.2 Demand Characteristics

Similar to FAJS, the team conducted an initial assessment of scheduled activity based on data provided in the OAG for a typical busy weekday in the peak month of 2012 for FALE. September 21, 2012 was the design day selected for this preliminary analysis. On this day, a total of 157 commercial flights were scheduled, with the vast majority of activity being domestic, and only six regional/international flights (Table 5).

Table 5: FALE 2012 Design Day Operations

Type of Flight	Domestic	Regional	International	Total
Passenger	147	2	4	153
Cargo	4	-	-	4
Total	151	2	4	157

Preliminary analyses were completed similarly to those for FAJS in section 4.2. The peak arrival period at FALE on this busy day had 9 scheduled arrival movements, the peak departure period had 12 scheduled departure movements, and the peak total scheduled movements were 15 (Figure 14).

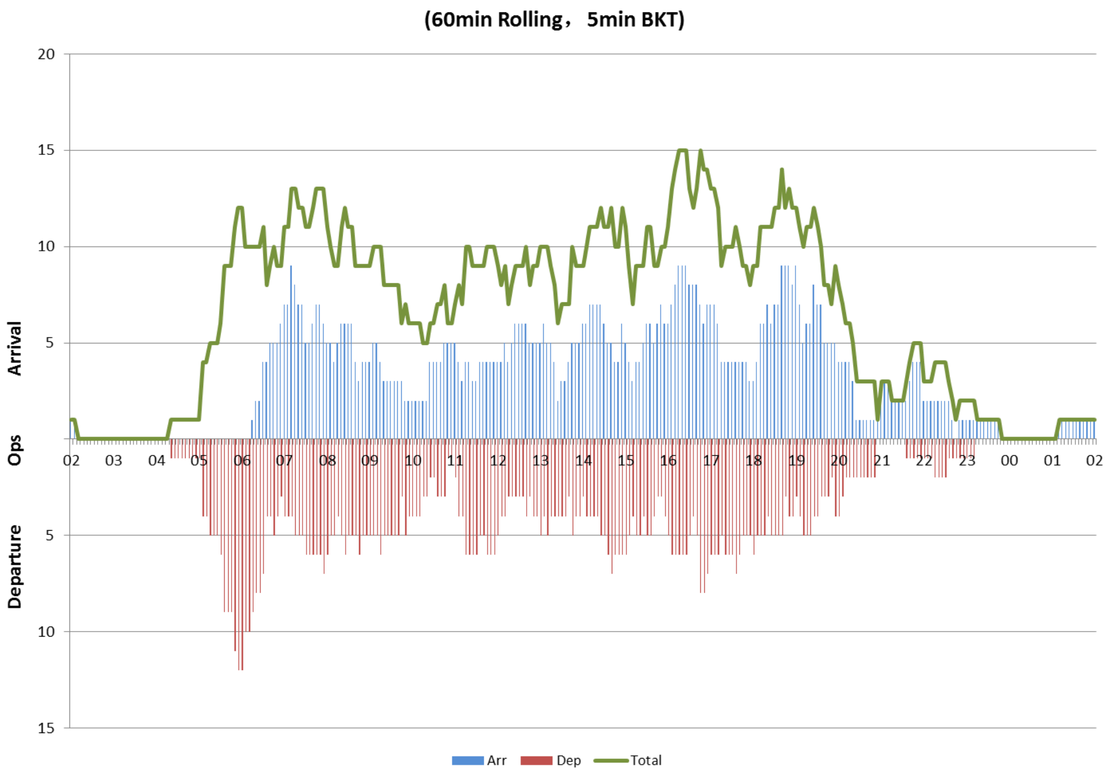


Figure 14: FALE -Hourly Profile of Aircraft Movements 2012 Design Day Total

The most common class of aircraft at FALE is Code C, with the B-737-800 being the most prevalent aircraft type. Over 75% of the aircraft is Code C, and about 23% is Code B. FALE is designated a diversion airport for Code F aircraft, though none of these aircraft serve FALE on a regularly scheduled basis. (For a description of aircraft codes appearing in Figure 15, see Appendix D.)

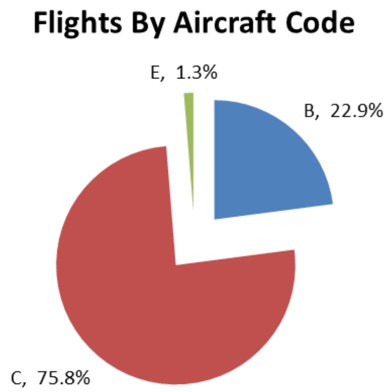


Figure 15: FALE - Flights by Aircraft Code

South African Airways provides 46% of the service to FALE. Five other airlines provide the balance of scheduled airline service. GA activity at FALE is limited in part due to lack of a Fixed-Based Operator (FBO) and other facilities, but also due the existence of other GA airports in the region (Virginia and Pietermaritzburg).

Virtually all of the demand at FALE is to domestic destinations (Table 6). Of the 157 daily flights, only six are to international destinations—one flight to Dubai and the other five to other cities on the continent. Together, flights to Johannesburg and Cape Town account for nearly 70% of demand at FALE.

Table 6: FALE Origin-Destination Mix

Rank	Region/Airport	% of Operations
1	Africa – FAJS	49.0%
2	Africa – FACT	20.4%
3	Africa – FAPE	8.3%
4	Africa – FALA	7.6%
5	Africa – FAEL	4.5%
6	Africa – FAKN	2.5%
7	Africa – FABL	2.5%
8	Africa – FQMA	1.3%
9	Africa – FLLS	1.3%
10	Africa – FAGG	1.3%
11	M. East – OMDB	1.3%

FALE opened to passenger traffic on 1 May 2010, replacing the old Durban International Airport. It is a key airport for domestic services throughout South Africa. FALE climbed to the 9th busiest spot in Africa according to 2010 statistics, despite not being open for the first four months of that year. An ACSA demand forecast study showed passenger volume at FALE is projected to grow from 4.9 million in 2011 to 16.8 million in 2035 at an average growth rate of 5.17% annually. Growing from a basis of 54,718 air traffic movements in 2011, 2035 air traffic movements are forecast to increase to 610,767, for an average annual growth of 4.77%. The same study also projected that peak hour number of movements is projected to grow to 22 in the year 2020.

4.3.3 Airspace

FALE provides the following ATC services: ground movement control, aerodrome control, and terminal control for FALE, FAVG, and FAPM from the FALE ATCC. The FALE TMA (Figure 16) services traffic arriving from FALE, FAPM, and FAVG. The TMA has an estimated capacity of 34 aircraft per hour, of which FALE holds the majority of the capacity at approximately 70%.

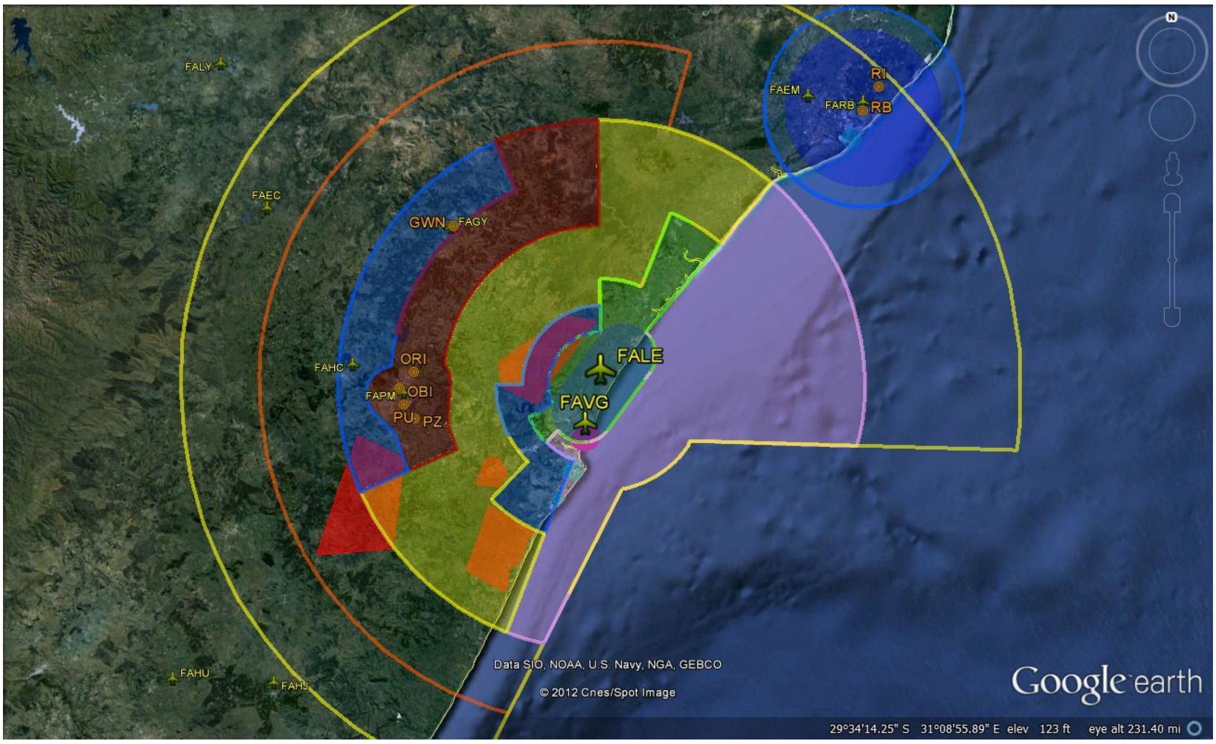


Figure 16: FALE Airspace

FALE, a Level 3 coordinated airport, is a one-runway operation, and has a declared IFR capacity of 24 movements per hour as stated by ATNS. Demand and capacity balancing is first established through the issuance of airport slots through the World Scheduling Guidelines model as advocated by IATA. Currently, the demand at FALE is significantly lower than the capacity. Peak movements in a day reach a level of 12–14 flights in an hour.

Even though there are low demands placed on the FALE airfield and airspace, several challenges were identified that impact the ability of ATNS to increase its capacity. The challenges are grouped into three major areas, which are described next.

4.3.3.1 Current capacity management practices

FALE is currently under 24-hour demand and capacity management through AFT by the CAMU. This means that every flight either departing or arriving at FALE is controlled by a CTOT. The AFT assigns runway usage times for departures in chronological order based on the schedule, should there be no constraint in effect. This produces three issues. The first is that the CTOT is sometimes not the same as the issued airport slot. (This can be the case as the AFT adjusts the airport slot to match tactical requirements). Due to a lack of understanding of slot allocation practices, this causes confusion between ATC and airport management (ACSA). Second, the AFT does not take into account the necessary separation requirements between successive departures. The AFT may schedule a heavy aircraft (e.g., Airbus 340-600) after a turboprop (e.g., Bombardier Dash 8). This departing pair requires a larger separation than the minimum CTOT separation of two minutes will allow. Third, the CTOT is applied to flights when demand is significantly lower than capacity, which, in some cases, produces unnecessary delays for flights departing from FALE and arriving at airports which do not have a TMI in place, for example a flight from FALE to Port Elizabeth Airport (FAPE). The efficiency of traffic departing from FALE to smaller non-TMI airports could be impacted by these practices.

4.3.3.2 Fleet mix operational challenges

FALE operations allow for all different aircraft types. The majority of IFR aircraft are medium-wake category aircraft, commuter and business jets, and a small amount of heavy airframes. The aircraft mix poses sequencing challenges for ATC.

4.3.3.3 Operations Affecting FALE

Virginia Airport (FAVG), located to the south of FALE, serves VFR GA and flight school traffic, comprised of fixed and rotary wing aircraft. The level of control in this airspace could affect the capacity of FALE, because IFR flights into FAVG are required to complete ILS approaches at FALE with a "break off" for visual positioning into FAVG. The majority of VFR traffic routing to and from FAVG are also required to communicate with FALE ATC, adding to frequency congestion. It was stated that as a result of previous airspace penetrations by VFR traffic, ATCs at FALE are continuously cognizant of this, possibly leading to increased work load.

IFR training flights are carried out by light aircraft (single- and twin-engine propeller driven aircraft) using the VOR and ILS at FALE. This significantly contributes to demand and increases workload on controllers.

Traffic arriving and departing from FAPM transiting the FALE TMA contribute to airspace complexity.

Parachuting activities requiring sectors of the TMA for high level parachuting.

During the construction of FALE there was major concern about swallow activity south of the RW06 threshold. Since the opening of the airport, there have been no occasions of swallow activity curtailing operations at the airport.

There has been continued opposition to aircraft noise from certain segments of the surrounding community of FALE.

4.3.4 Airside

As indicated in section 4.3.2, FALE is currently serving less than 15 air traffic movements per hour, whereas its capacity is 24 per hour. However, it is also acknowledged that opportunities exist to improve operational efficiency by implementing improvements to reduce taxi time and distance and otherwise enhance performance for individual aircraft.

Figure 17 illustrates the airfield layout of FALE and highlights some of the most critical issues influencing performance. These issues are discussed in the following sections.

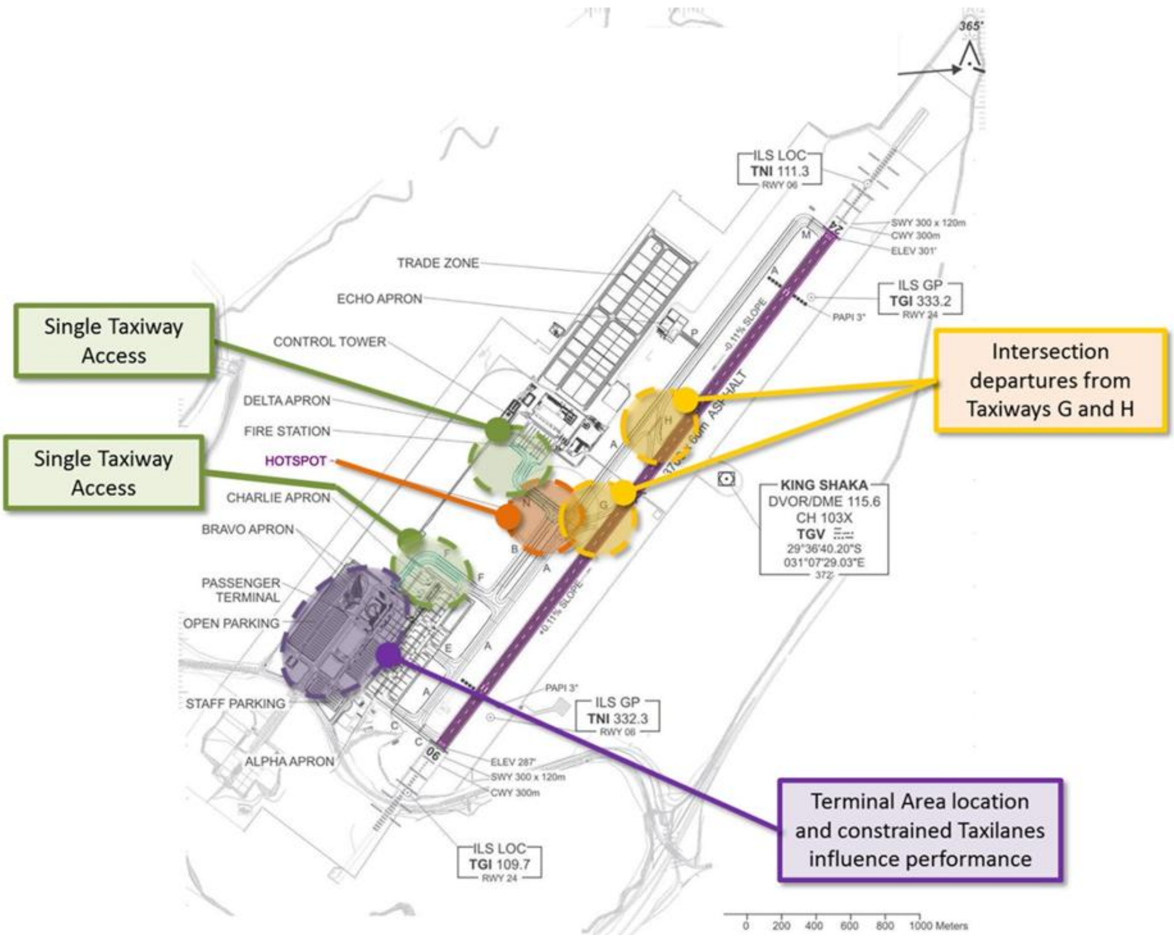


Figure 17: FALE Airport Layout Issues

The location of the terminal area on the far south end of the runway was selected to minimise site development costs based on terrain and the location of the terminal platform established (but not constructed) in the 1970s. This location is also designed with a long-term master plan in mind that involves a second parallel runway and additional terminal facilities to the west.

4.3.4.1 Hot Spot

The most significant airport operational issue is the "hot spot" at the intersection of taxiways Golf, Alpha and November. During south flow operations, departing aircraft must hold on Taxiway Bravo when aircraft are landing on Runway 24 until the arrival clears the runway exit at Golf onto Alpha. Once the arrival aircraft clears the exit, then the departing aircraft can proceed northbound on Alpha. While this does not happen frequently at current demand levels, when a conflict does occur, it requires a 3–4 minute increase in taxi time. Potential solutions to the hot spot will be addressed in later tasks and include extending Taxiway Bravo beyond taxiway Golf.

Each of these scenarios will be further explored in this study to determine the trigger point at which the taxi time savings might justify the capital cost of the improvement.

Based on the team's discussions with ATNS and ACSA specialists, along with observations from the ATCT, we prepared Figure 18 and Figure 19 to illustrate the primary runway use configurations and related taxi flow patterns. These diagrams are presented herein for confirmation from ATNS and ACSA, and to help illustrate the operational flows of the airport under typical operating conditions.

4.3.4.2 South Flow Operations

South flow operations (Figure 18) are efficient for arriving aircraft but result in long taxi times for departing aircraft due to the location of the terminal at the south end of the runway. During south flow operations, most departures elect to execute an intersection departure from Taxiway Hotel to reduce taxi time. These aircraft are held on Taxiway Alpha at the CAT II hold line before being cleared for take-off from Hotel. There is a potential concern that once cleared for take-off, pilots cannot see aircraft on the Runway 24 approach given the angle of the rapid exit taxiway. Because these aircraft are held on Alpha, pilots do have clear view of the approach prior to receiving departure clearance. Nonetheless, aircraft held on Alpha awaiting departure clearance block other aircraft taxiing on Alpha, which impacts capacity during peak hours.

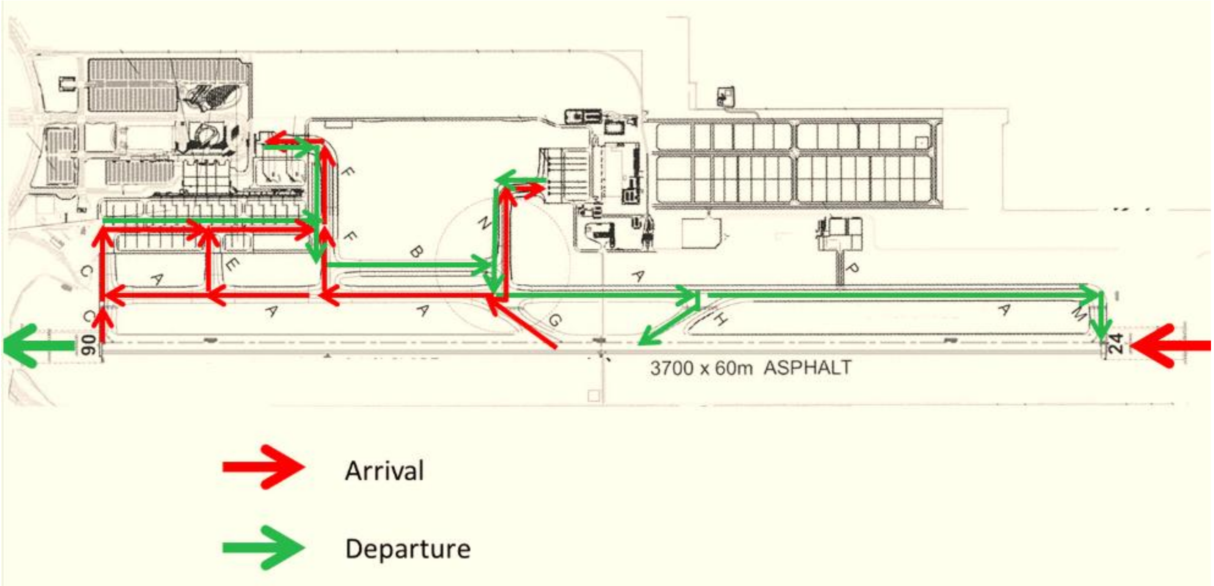


Figure 18: FALE South Flow Operations

4.3.4.3 North Flow Operations

North flow operations are preferred for departures given the proximity of the 06 runway end to the terminal, but result in long taxi distances for arrivals. At times, the lack of a departure end hold pad at this end of the runway makes it difficult for ATC to optimise the departure queue. At the current level of demand, this is not considered a major concern. The development of a hold pad would be more effective at higher levels of activity. Another issue is the lack of a CAT I hold line for departing aircraft. Aircraft are held at the CAT II hold line, even in CAT I conditions. The distance between the CAT II hold line and the runway threshold require longer taxi times and results in unnecessary delays.[5]

It is understood that obstructions are in the process of being cleared at the north end of the airport that will enable CAT II operations, which is the reason given for not having a CAT I hold line. This issue will be further explored to assess the potential benefit of improved markings.

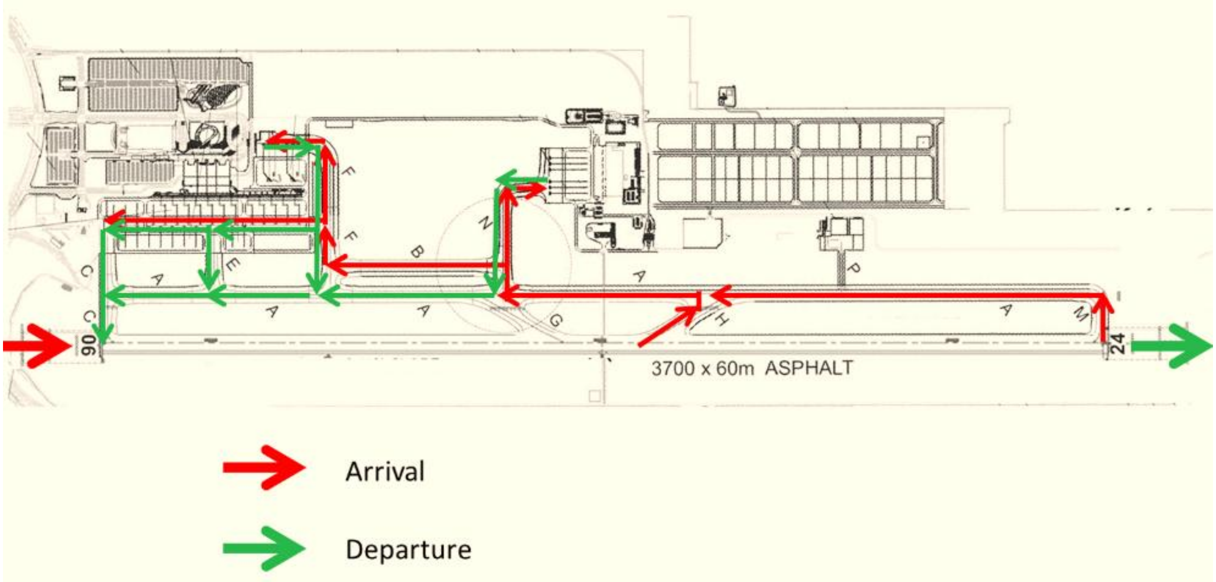


Figure 19: FALE North Flow Operations

4.3.4.4 One Way In/One Way Out Aprons

Several apron areas at FALE are accessed by a single taxiway, thereby resulting in the potential for head-to-head operations. The international apron on the west side of the terminal is accessed by taxiway Foxtrot, the Delta Apron is used by cargo operators, and limited military and state protocol activity is accessed by Taxiway November. At the current levels of demand, these single-access taxiways do not present a problem, and at most require delays of several minutes if there is a conflict. As peak period demand increases, this may result in added congestion and thus will be explored as part of this study.

4.3.4.5 Code F Operations

While FALE does not serve A380s on a regular schedule basis, the airport is designated as a Code F reliever airport. The airport has two designated aprons with four total parking positions for Code F aircraft. The Alpha Apron is limited to Code C aircraft gates and separations even though it is served by taxiways Charlie, Echo and Foxtrot, which are all Code F capable taxiways. If FALE is to serve a fleet mix that contained more than four aircraft of larger than Code C within the same time period, significant apron changes would be required.

[5] The Airside Capacity Enhancement Initiatives developed by ATNS and ACSA identified KSIA ref. No 1.7 "Visual Aids" includes an Initiative to implement CAT I hold lines as an Infrastructure Enhancement.

4.3.4.6 GA Activity

FALE has limited facilities for GA activity, and lacks a substantial Fixed-Base Operator (FBO) operation. However, most of the region's GA activity is efficiently served at FAVG and FAPM. There were discussions about the possibility of FAVG closing sometime in the future, which could potentially place pressure to serve GA activity at FALE.

There is currently no dedicated GA apron, and FALE is not encouraging GA activity. ACSA will be converting the aviation gas (AVGAS) holding facility to JETA1 due to lack of demand for AVGAS. However, if FAVG closes, that GA activity may request to use FALE, requiring associated facilities.

Another related issue is international GA activity, which is typically represented by corporate GA operations. Because the other regional GA airports lack immigration facilities, international GA arrivals land at FALE to allow passengers to clear immigration and customs, and then will proceed to their destination airport. At current levels of activity, this is not a significant issue.

4.3.4.7 Major Events

Demand at FALE often increases beyond its current capacity during special events, such as the FIFA World Cup in 2010. Due to the lack of apron space at FALE during such events, charter aircraft operations are often required to fly four operations rather than two, as they must drop off passengers then fly out empty to be parked at another airport until returning empty to collect their passengers. While such events are not frequent, they do place pressure on the FALE ATC environment for short periods of time. Potential demand placed on resources during special events is not considered by ACSA in the long-term planning.

4.4 Cape Town International Airport (FACT)

This section describes the meetings and site visit observations conducted in Cape Town, South Africa.

4.4.1 Meetings

The Metron Team conducted site visits and meetings in Cape Town with ATNS and ACSA stakeholders 11–12 October 2012. The team visited the ATNS and ACSA facilities at FACT, and met with the FACT Precinct Planning team. The attendees are listed in Appendix C. The findings of these meetings are summarised in the following sections.

4.4.2 Demand Characteristics

Similar to FAJS and FALE, the team conducted an assessment of scheduled activity based on data provided in the OAG for a typically busy weekday in the peak month of 2012 for FACT. 30 March 2012 was the design day selected for this preliminary analysis. (See 4.2.2 for a description of the initial design day methodology.) On this day, a total of 249 commercial flights were scheduled, as summarised in Table 7. As shown, the vast majority of activity at FACT is domestic, with about 12% of total movements to regional or international destinations.

Table 7: FACT 2012 Design Day Operations

Type of Flight	Domestic	Regional	International	Total
Passenger	217	12	17	246
Cargo	3	-	-	3
Total	220	12	17	249

The peak arrival period on this busy day had 12 scheduled arrival movements, the peak departure period had 17 scheduled departure movements, and the peak total scheduled movements were 24.

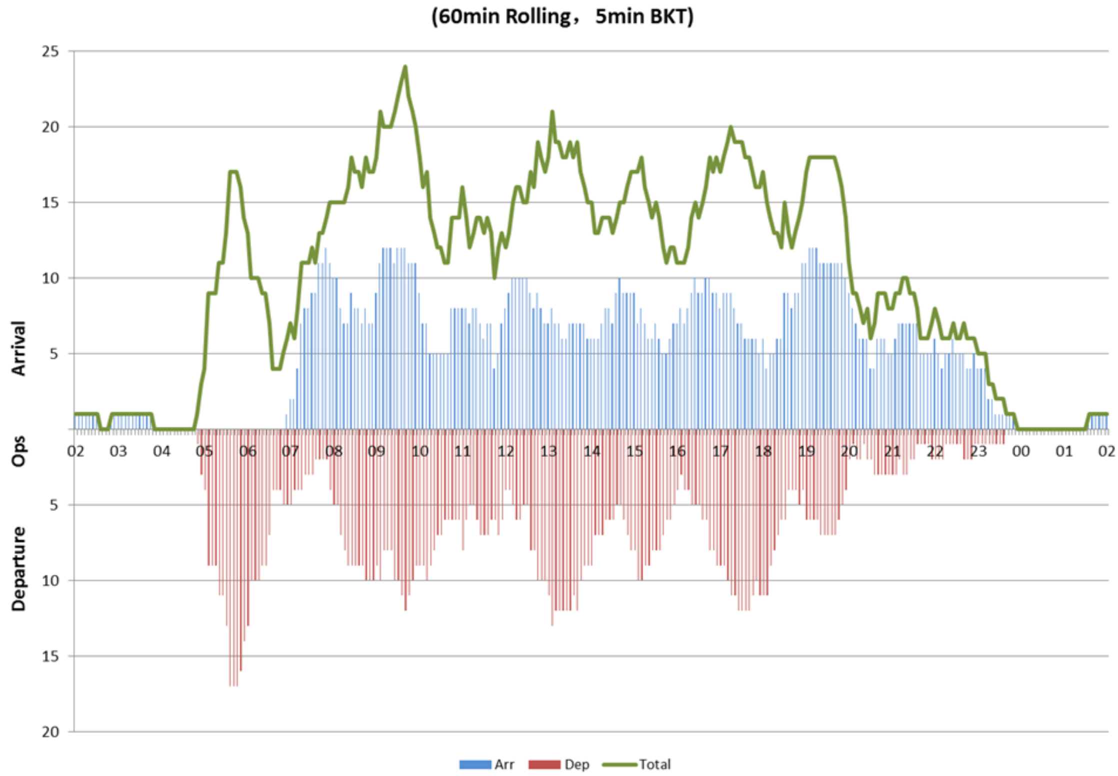


Figure 20: FACT- Hourly Profile of Aircraft Movements 2012 Design Day Total

As shown in Figure 21, the most common class of aircraft at FACT is Code C, with the B-737-800 being the most prevalent aircraft type. About 73% of the traffic is Code C, about 20% is Code B, and the balance is Code E. Although GA makes up a significant portion of the traffic at FACT, it is important to note that this scheduled data does not include GA. (For a description of aircraft codes appearing in Figure 21, see Appendix D.)

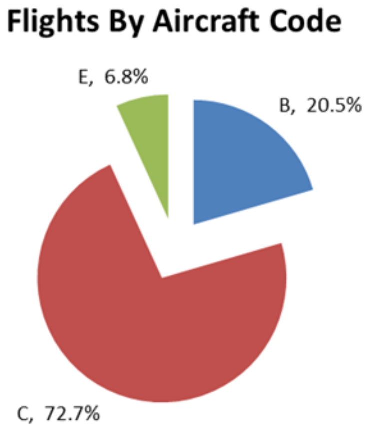


Figure 21: FACT Flights by Aircraft Code

South African Airways provides 39% of the service to FACT, followed by British Airways with 15.3% of the flights. Ten other airlines provide the balance of scheduled airline service, and six international long-haul flights range from 0.4–3.2% of scheduled service. GA activity significantly influences performance at FACT, representing as much as 30% of total movements. The user mix impacts the taxi routes to and from the assigned runways, as GA flights are less time-sensitive but share limited taxiways with commercial activity. This is particularly an issue because the single taxi lane between the A and B aprons functions as the parallel taxiway for arrivals and departures.

The vast majority of the demand at FACT is to domestic and other regional destinations within the African continent. Johannesburg is the most heavily served destination with 47% of the traffic, followed by FALE and FALA with 10.8% and 10.4%, respectively. FACT also serves long-haul international flights to Amsterdam, London, and Dubai. Only the top five are shown in Table 8.

Table 8: FACT Origin-Destination Mix

Rank	Region/Airport	% of Operations
1	Africa – FAJS	47.0%
2	Africa – FALE	10.8%
3	Africa – FALA	10.4%
4	Africa – FAPE	7.2%
5	Africa – FAEL	4.0%

Lastly, FACT is the second busiest airport in South Africa and fourth busiest in Africa. According to a demand forecast study performed by ACSA, passenger volume at FACT is projected to have an average growth rate of 4.95% from 8.2 MAP in the year 2011 to 27.2 MAP in 2035. Air traffic at FACT is projected to grow from 93,623 total movements in 2011 to 280,079 in 2035, for an annual average growth of 4.47%. Peak hour number of movements is projected to reach 43 in the year 2020.

4.4.3 Airspace

FACT is a two-runway operation. The airport's primary runway, 01/19, is used for the majority of the traffic. FACT has an additional runway, 16/34, that crosses 01/19 and is used for less than 5% of the operations. FACT has a declared capacity of 30 movements per hour; ATC tries to balance the demand so that the airport can serve 15 departures and 15 arrivals per hour. ATC may also allocate demand as 10/20 or 20/10. It is important to mention that the arrival and departure rates can be adjusted accordingly depending on the demand but it does not affect the overall capacity. This balance is first established through the issuance of airport slots through the World Scheduling Guidelines model as advocated by IATA. FACT is a Level 3 coordinated airport. Pre-Tactical and tactical demand and capacity management is managed through the use of the AFT at the CAMU.

The overlying TMA (Figure 22) has an estimated capacity of 35 flights per hour as supplied by ATNS, and FACT traffic comprises over 85% of the traffic into the TMA. The study team was advised by ATC specialists in FACT that the en-route sectors in FACT FIR are operating below capacity.

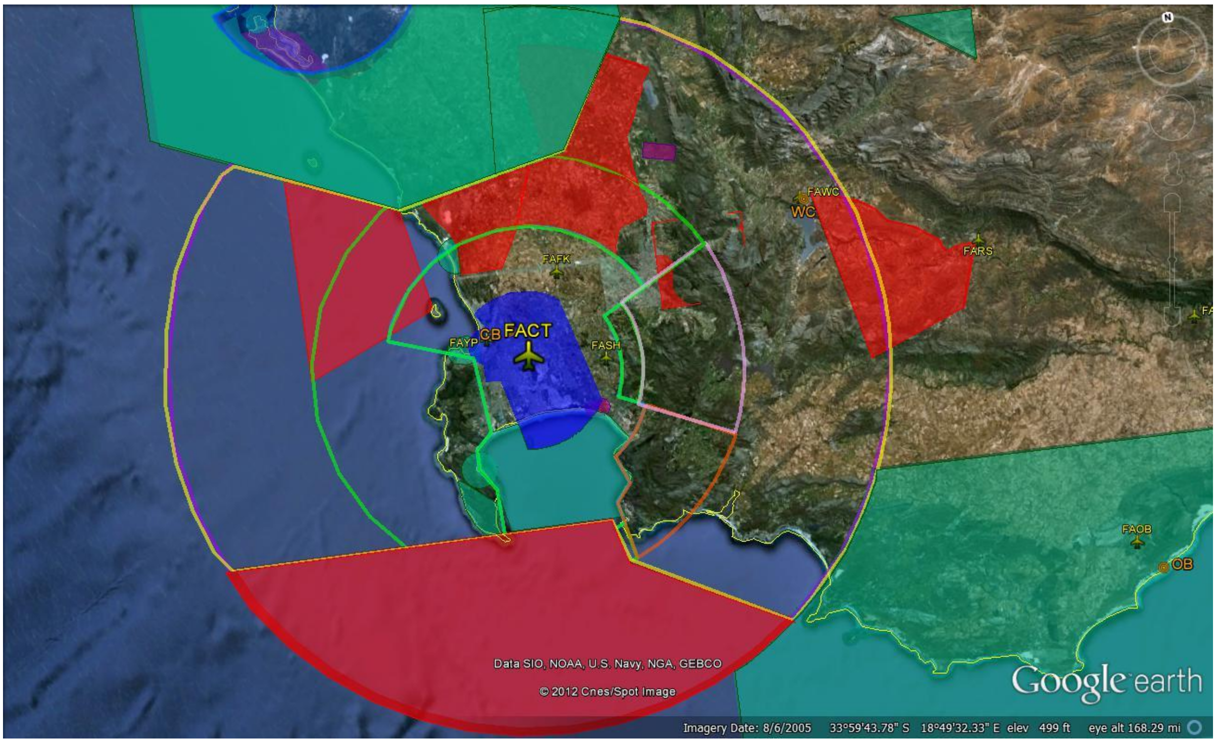


Figure 22: FACT Airspace

Several challenges were identified that impact the ability of ATNS to increase capacity utilization for operations at FACT. The challenges are grouped into five major areas, which are described next.

4.4.3.1 Current capacity management practices

Demand and capacity management at FACT is currently managed via TMIs on a 24-hour basis by the CAMU using Metron Aviation's AFT. This means that every flight either departing or arriving at FACT is managed by the issuance of a CTOT. The AFT assigns runway usage times for departures by their schedule should there be required capacity. In general discussions with various parties, it was seen that there is a lack of understanding by stakeholders on slot allocation procedures. The AFT allocation of slots does not take into account the necessary wake turbulence separation requirements between successive departures. For example, the AFT may schedule a heavy aircraft (e.g., Airbus 340-600) after a turboprop (e.g., Bombardier Dash 8) which requires a separation for this departing pair that is larger than the minimum CTOT separation of two minutes. The requirement to strictly comply with CTOT limits the controllers' ability to tactically manage their traffic for efficient departure flows.

4.4.3.2 Fleet mix operational challenges

FACT operations include an array of different aircraft types. The majority of IFR aircraft are comprised of medium range aircraft, commuter and business jets, and a small amount of heavy airframes. The fleet mix poses sequencing challenges for ATC to ensure service to all demand while maintaining sequencing and safe separation. In addition to fleet mix, FACT ATCs face difficulties of sequencing traffic for landing at FACT when some aircraft are carrying out PBN approaches while others are carrying out non-PBN instrument approaches.

There is no specific airfield dedicated to GA traffic in the Cape Town metropolis; Fisanteraal and Stellenbosch do manage some GA traffic, however, the majority of GA traffic uses FACT. This means that FACT absorbs a large number of business and training flights (fixed- and rotary wing). With the high level of GA activity, this results in extensive mixed aircraft type operations. The majority of aircraft are comprised of medium wake category aircraft; however, as stated there are light and heavy aircraft operating daily. The mixture of aircraft types poses separation and sequencing challenges for ATC.

ACSA statistics indicate that over the last six years, unscheduled movements have ranged between 16% to 23% of total aircraft movements. ACSA records also indicate that 79% of the non-scheduled movements are smaller than Code C aircraft, creating wake turbulence and sequencing requirements that increase the approach and departure separations to accommodate these aircraft. The variability in both approach speeds and ground taxiing speeds also increases controller workload and results in increased taxi times and congestion, particularly during peak periods. Although statistics also indicate that unscheduled operations are greater at off-peak periods for commercially scheduled flights, there are periods during which GA and scheduled activity are nearly equal. As with the general pattern of air traffic at FACT, GA activity follows a seasonal and event-based demand, so GA activity increases at the same times of the year that commercial operations increase. There are also four registered flight training schools within the FACT GA apron, which creates additional interaction between GA and commercial activity.

4.4.3.3 Mountainous terrain

The mountainous terrain surrounding FACT limits the amount of available airspace to:

- Utilise more precision approaches.
- Facilitate more direct routings for more appropriately equipped RNAV aircraft.
- Utilise more direct routing of appropriately equipped RNAV aircraft.
- Develop SID and STAR designs.

It was stated that thirty percent of aircraft flying into FACT have RNAV equipage to allow for more efficient routing. Factual statistics to support this are being sought as part of Task 2. An increase in equipage throughout the fleet would enable more precision routing, resulting in increased efficiencies.

4.4.3.4 Military airspace

The Ysterplaat (FAYP) military facility is located to the northwest of the airport, which further constrains the amount of civilian airspace with which to sequence traffic. All traffic arriving and departing from FAYP are managed by FACT terminal control. IFR traffic bound for FAYP are sequenced with FACT traffic onto the ILS at FACT for a "break off" into FAYP.

The South African Navy requires airspace to conduct naval firing and manoeuvres; while this is facilitated through the flexible airspace concept it does bring about limitations on airspace usage.

4.4.3.5 VFR traffic

There is high demand from VFR traffic at FACT. Currently, should a flight not file a flight plan, the CAMU does not receive information on the VFR traffic into and out of South African airports; therefore, the AFT cannot include VFR flights into a TMI. This could result in over-prescription of demand into the TMA and airport, which can lead to increased holding and increased ground delays for flights into and out of FACT.

4.4.4 Airside

The key capacity-related issue at FACT is the physical limitation of the airfield and the operational complications created by those limitations. Although the runway system consists of two intersecting, dependent runways, Runway 16/34, which is 1,701 metres in length, is used only occasionally by GA and other Code A and B aircraft. In recent times, it has been used more frequently as a taxiway than for runway operations. Runway 01/19, which is 3,201 metres in length, functions as the sole runway throughout the peak hour on most days, handling the full mix of GA and larger Code C, D, and E aircraft.

The airfield has several notable hot spots that are a significant source of congestion and require extensive controller workload to efficiently manage traffic. Nevertheless, ATNS controllers express concerns about the workload they must dedicate to addressing airport pavement and terrain constraints. The traffic managers have successfully limited delays within the current level of activity and flight schedules. However, as activity increases, higher levels of delay will be associated with the limitations in the aircraft movement areas and aircraft gates. ACSA has identified various challenges and constraints that can be addressed as part of Master Plan improvements. While most of these have not translated into significant delays at the current levels of activity, some may become more challenging in the future.

The limitations inherent in the airfield layout provide little flexibility for ATC to respond to off-nominal conditions, inclement weather, or special events that result in higher work load levels for short periods of time. Other limitations include the extreme terrain, noise abatement and military airspace restrictions. ATC applies in-trail separation of 5NM between successive arrivals, and 2-minute minimum gaps between departures, thereby limiting capacity to about 30 movements per hour.

Figure 23 illustrates the airfield layout of FACT and highlights some of the most critical issues influencing performance.

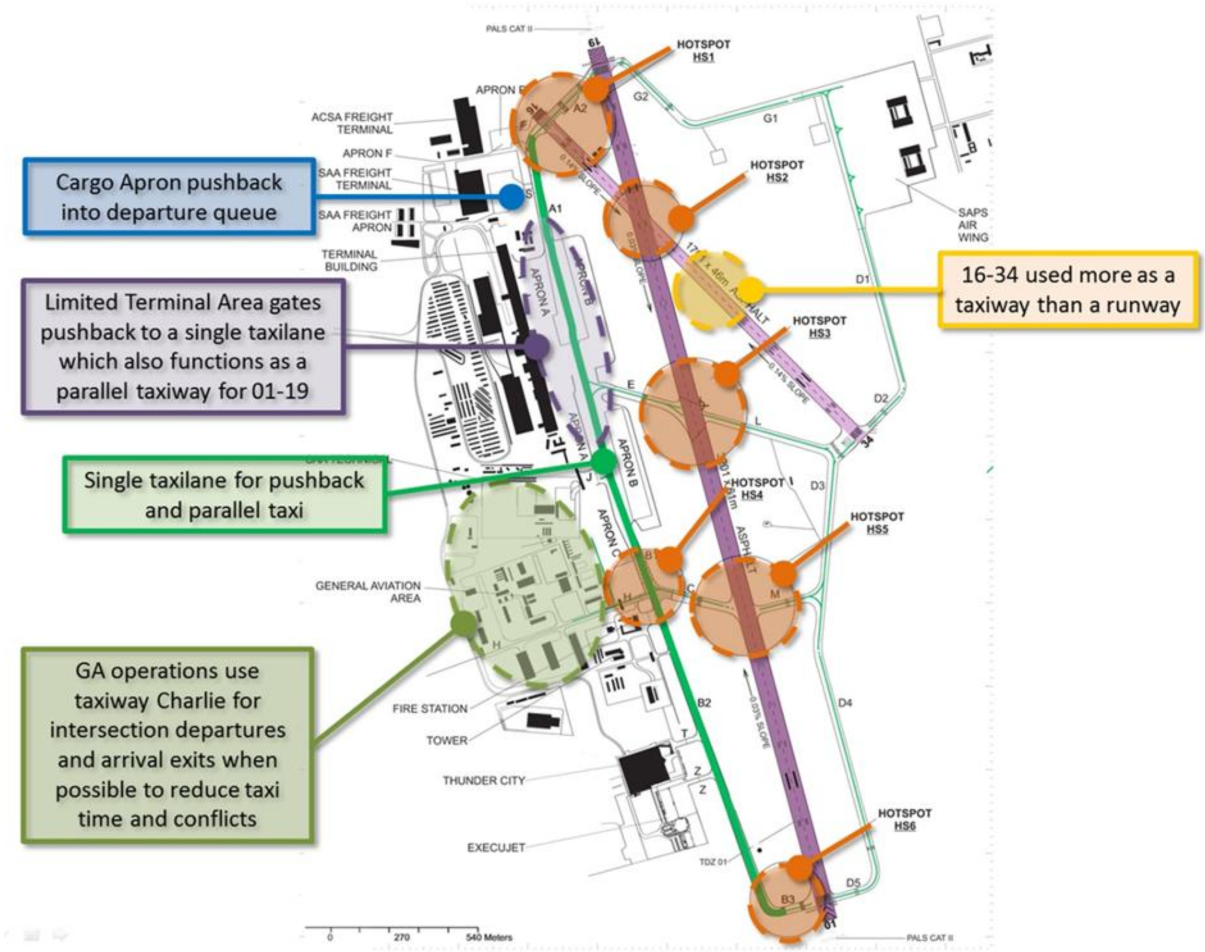


Figure 23: FACT Airport Layout Issues

Based on the team's discussions with ATNS and ACSA specialists, along with observations from the ATCT, we prepared Figure 24 and Figure 25 to illustrate the primary runway use configurations and related taxi flow patterns for north and south flow operations. These diagrams are presented herein for confirmation from ATNS and ACSA, and to help illustrate the operational flows of the airport under typical operating conditions.

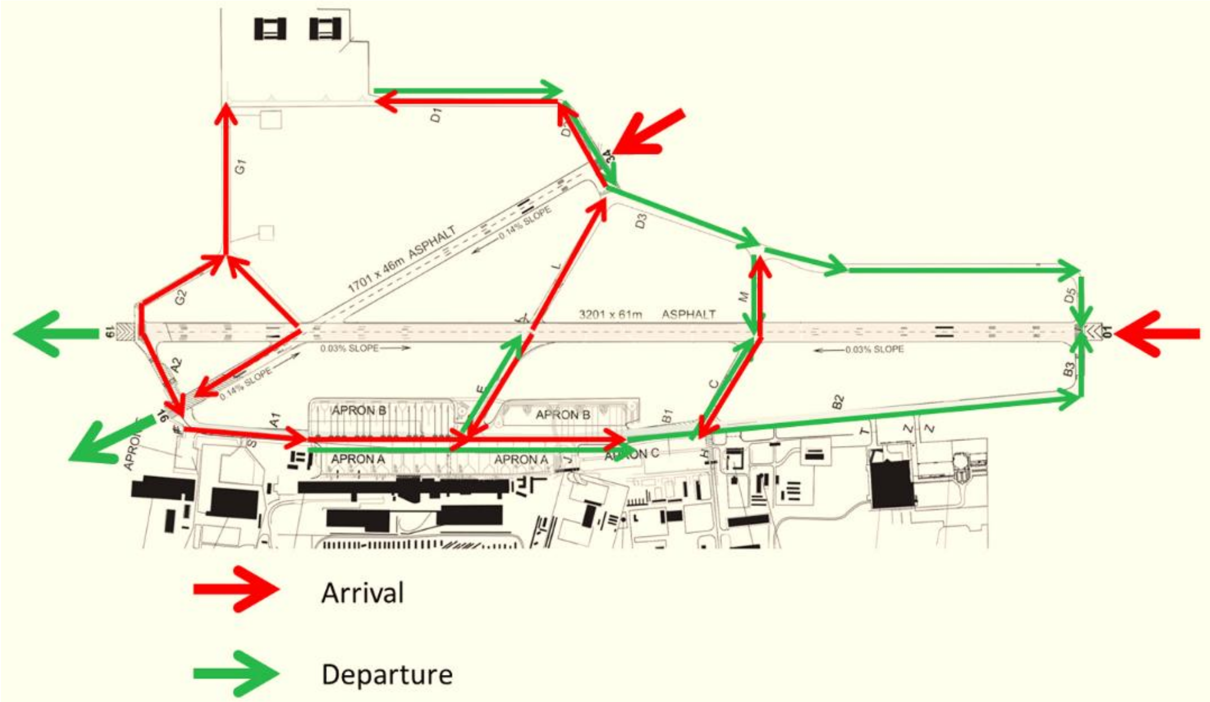


Figure 24: FACT North Flow Operations

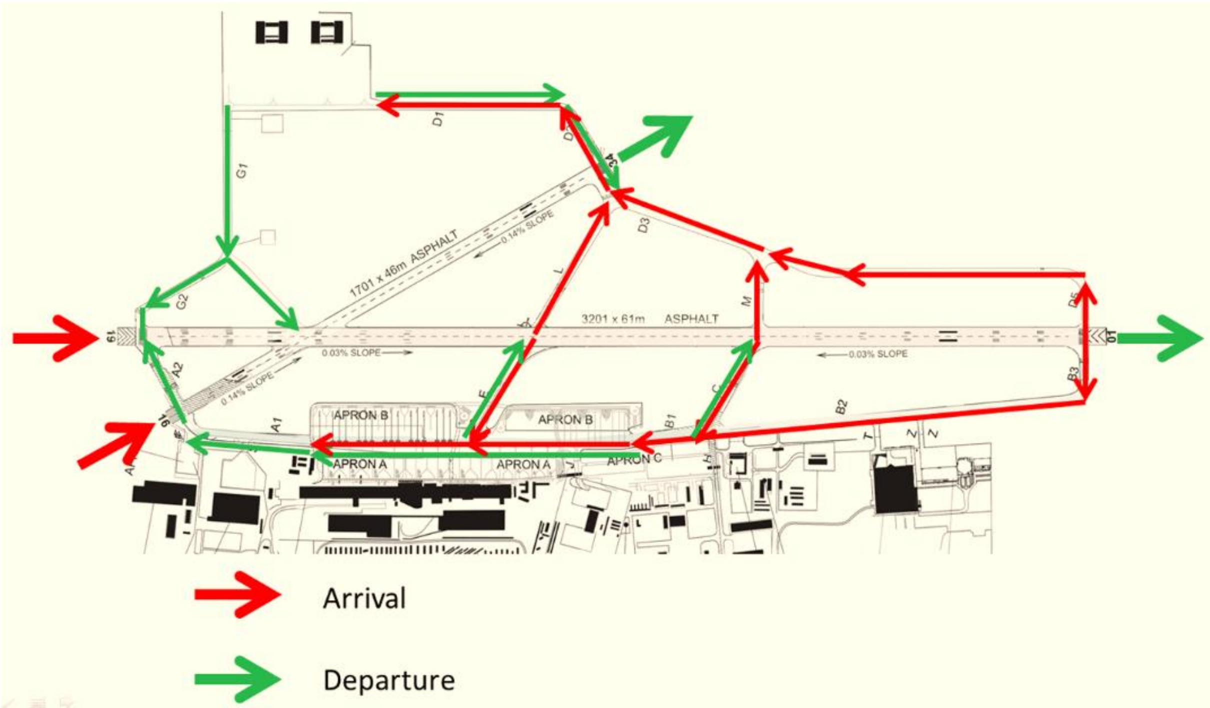


Figure 25: FACT South Flow Operations

4.4.4.1 Single Taxilane for A, B and C Aprons

The ACSA FACT delay analysis for 2011 indicates that during the peak hours only 2% to 11% of total delays were caused by pushback and taxi lane congestion.[6] While this is a minimum impact within the current schedule, as activity increases, higher levels of delay are expected to occur as a result of the use of the single taxi lane as a substitute for a parallel taxiway to Runway 01/19 through the A, B, and C aprons. The current gate layout requires contact stands 1-12 to push back towards remote stands 8-14 on the opposite side of the taxi lane (Figure 26).

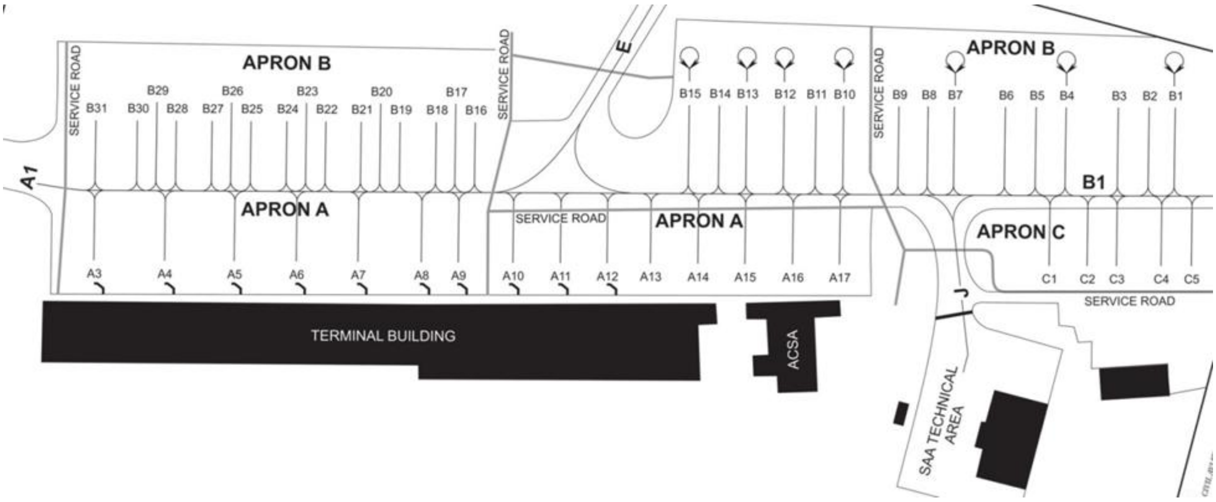


Figure 26: FACT Apron Area

The location of the GA apron and the high levels of unscheduled activity require aircraft using the Runway 19 threshold for departure to taxi through this same single taxi lane. Fortunately, only 21% of the unscheduled activity is Code C or larger, making the use of taxiway Charlie the logical point for intersection departures and runway exits. However, any fully loaded cargo aircraft assigned to Runway 01 for departure needs to taxi directly through the commercial aprons, adding another risk of delay from pushback conflicts.

4.4.4.2 Rapid Exit Taxiways

The lack of RETs, and the sub-optimal location and number of taxiways on Runway 01/19 result in longer than average runway occupancy and taxi times. Taxiways Charlie and Echo can function as RETs from a Runway 01 arrival; however, while in south flow, ATNS indicates that it takes an aircraft arriving on 19 nearly as much taxi time to exit via taxiway Charlie as it takes to exit at the opposite runway end and taxi back to the terminal area. Correctly designed and positioned RETs are already acknowledged as crucial to minimising runway occupancy time in the ATNS/ACSA list of enhancement initiatives.[7] However, these improvements would be most effective if implemented in conjunction with other taxiway network improvements, such as a parallel taxiway or other bypass taxiways to eliminate head-to-head movement conflicts.

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[6] ACSA CTIA Airside Capacity Study Presentation 12102012.pdf

[7] The Airside Capacity Enhancement Initiatives developed by ATNS and ACSA identified FACT ref. No 1.4 “RETs RATs” as Infrastructure Enhancements.

4.4.4.3 Arrival and Departure Holding Pads

ATNS identified schedule and gating issues that include last-minute sequencing changes in arrivals and departures. There are certain departure times that may have 3–6 flights assigned with the same CTOT. Depending on departure priorities or other delays, holding pads near the departure threshold would enable aircraft with higher priority to bypass a less time-critical departure that might be ahead in the queue. Similarly, flights arriving ahead of schedule or with last-minute gate changes could be sent to holding bays if the flight previously assigned to their gate had not yet departed.[8] There is currently insufficient space within the airside boundary fence directly adjacent to the Runway 01/19 thresholds for holding pads or bypass taxiways. The possibility of reassigning nearby uses to other airside locations is consistent with longer term Master Plan development and can be investigated in the Technical Analysis task.

4.4.4.4 Interactions with General Aviation Activity

In addition to the complications of the traffic mix described in section 4.4.3.2, there are also four registered flight training schools within the FACT GA apron, which creates additional interaction between GA and commercial activity.

Furthermore, the GA apron and private FBOs are located west of Runway 01/19, along the southwest airport boundary. This configuration has allocated a disproportionate amount of the most valuable airside-landside boundary to unscheduled activity that has great potential to increase delays and reduce operational efficiency.

Currently, there are no restrictions or incentives related to unscheduled activity, and there is positive revenue associated with such GA operations. As part of the technical analysis the team will review the land use assignments, revenue structures, and potential incentives to more effectively shape the future of GA and unscheduled activity at FACT in comparison to commercial operations—all in an effort to optimise joint compatibility of these market segments.

4.4.4.5 Airfield Hot Spots

There are six hot spots indicated on Figure 23. Two of these hot spots are the result of Line-of-sight conflicts from the ATCT, while others relate to hold points and crossing conflicts. As an example of this interaction, two hot spots exist in the vicinity of the Alpha and Bravo aprons, where the Echo-Lima taxiways and the Charlie-Mike taxiways cross Runway 01/19. The Charlie-Mike taxiway crossing moves westward into yet another hot spot at the Charlie-Hotel taxiway intersections with the single taxi lane that serves these aprons and also serves as a parallel taxiway for aircraft directed to depart on Runway 01. The interaction between taxiing aircraft and aircraft pushing back is a cause of delay and congestion in this area. A related issue in this area is the procedures by which pushback clearance and gate assignments are issued, as well as the lack of visibility from the ATCT. The apron control process may warrant further consideration to enhance operational efficiency.

[8] The Airside Capacity Enhancement Initiatives developed by ATNS and ACSA identified FACT ref. No 1.5 "Holding Bays" and 1.6 "Remote Holding Areas" are included as Infrastructure Enhancements.

4.4.4.6 Line-of-Site Issues

There are multiple locations on the airfield with limited visibility from the ATCT. The threshold of Runway 16 near taxiway A2, and the intersection of Taxiways Charlie and Bravo 1, are two areas that are not directly visible from the ATCT. As Runway 16 is barely used, and planned for decommissioning as part of the Master Plan, the visual obscurity of that threshold is not as critical. Special procedures are applied, and pilots are advised to exercise extreme caution in these areas. However, ATNS has indicated that when large aircraft are parked at the north end of the Bravo apron, Runway 19's threshold is also obscured from a clear line-of-site from the ATCT. Potential solutions may involve the use of cameras to augment visibility, or to increase tower height as part of Master Plan upgrades (which is a proposal in the master plan.

4.4.4.7 Intersection Departures

To reduce taxi times and distance, lighter aircraft are often requested to depart Runway 19 from the intersection with Taxiway Echo or Taxiway Charlie. Departures on Runway 01 are also directed to use the intersection with Taxiway Echo when possible to reduce taxi distance. If Runway 01 were in use for arrivals or departures, the use of intersection departures on Runway 01 would require hold times for coordination with operations on Runway 16/34.

4.4.4.8 CAT I/II Hold Lines

As is the case at FALE, there may be opportunities to improve performance and provide ATC with more flexibility by optimising the alignment and location of hold lines for operations during CAT I and CAT II conditions.

4.4.4.9 Aircraft Gate Limitations

The number and the size of aircraft parking positions throughout FACT will present additional constraints as activity increases. The Alpha Aprons have only 12 contact gates, and 70% of flights are assigned to these gates for passenger boarding and disembarkation to maintain high levels of service. This means that dwell times need to be 20 to 40 minutes on average, and not greater than 60 minutes. Flights not ready to depart before their remote gate time limits must be towed to remote stands, of which there are only 8–14 positions on the Bravo Apron (depending on aircraft type). Long-haul international flights, most of which are Code E, require longer parking periods between arrival and departure to meet their scheduled flight times. Although there is adequate depth for Code E positions on both the Alpha and Bravo Aprons, there is not sufficient depth for Code F stands. The limited depth and positions also constrain special requirements for certain aircraft types, like A340-600 washing, and increased clearances needed by the new B-747-800s.

These issues, as well as the limited area remaining for Ground Service Equipment (GSE) staging at gates, will need to be addressed incrementally, even before the Master Plan implementation is underway. The technical analysis phase will analyse the potential to capture additional space through changes to apron markings and limited additions of apron pavement that would be ultimately consistent with Master Plan developments.

4.4.4.10 Master Plan

ACSA intends to address some of the airfield challenges and constraints described throughout sections 4.4.3 and 4.4.4 as part of the Master Plan improvements. While many of these constraints do not yet result in significant delays at the current levels of activity, delays, congestion, and other inefficiencies are expected to increase in the future as demand continues to increase.

The current master plan calls for the realignment of Runway 01/19 to an 18/36 orientation, with the northern threshold offset to the east. In addition, the Master Plan includes a second parallel runway with lateral spacing of 1,350 metres, thereby enabling dual simultaneous instrument approaches. Other improvements are also contemplated as part of the Master Plan. The implementation of this Master Plan would significantly enhance capacity and improve performance. For purposes of this study, the team will focus on identifying and prioritising improvements in the near- to medium-term that are aligned with the long-term Master Plan vision but may be less costly to implement.

4.5 Common Observations

The following sections describe observations common to FAJS, FALE, and FACT that may impact this study's recommendations.

4.5.1 CAMU

Management of air traffic flow and capacity within South African sovereign and delegated airspace resides with the CAMU. Located at the Johannesburg ATCC, the CAMU manages airport slot allocation, and performs pre-tactical and tactical demand and capacity management using the Airport Flow Tool (AFT). In addition, the CAMU implements flexible use of airspace (FUA), and facilitates military exercises and operations, special and unusual events, and any other activity which might require the use of airspace for a particular time period. The unit is also responsible for the re-routing of traffic and management of the associated impact when flights are affected by adverse weather and temporary restricted or special use airspace in consultation with the aviation community in a collaborative decision making (CDM) process.

The Metron Team conducted a site visit to the CAMU on 5 October 2012, and met with CAMU staff. In addition to this, the CAMU's operation was discussed at all three ATCCs visited by the Metron Team. The following sections summarise the findings of those meetings.

4.5.1.1 CAMU Observations

A major issue identified during the study is the inability of the CAMU to institute an effective Airspace Flow Programme (AFP) in the FAJS TMA when demand exceeds the capacity, particularly in view of demand at FALA requiring metering of traffic into the FAJS TMA. The CAMU has recently introduced a daily TMI (between 1400 Z and 1700 Z) at FALA. While it is still too early to accurately assess the effects, early indications are that the TMI contributes to balancing demand against capacity in the FAJS TMA.

All the ATCCs made the point that the AFT does not take into account the necessary wake turbulence separation requirements between successive departures. With the requirement of strict adherence to CTOT, it is restricting the ability of the controllers to tactically manage their traffic for efficient departure flows. This restriction can be alleviated if the AFT allocated slots are based on direction of turn after take-off.

Both the CAMU and FAJS ATC noted that there is no clear communication between the two centers to effectively manage anticipated adverse conditions. It was noted that there are no Flow Management Positions (FMP) in any of the ATCCs. These FMPs would normally be manned by supervisory staff that would be aware of the ATCC system requirement and can communicate that with the CAMU – this does not happen. Without supervisors carrying out a FMP role it is difficult for the CAMU to know who to liaise with at the ATCCs; this lack of clear communication is leading to inefficiencies. Some of the flow restrictions instituted locally by the FAJS ATCC could be automated by the CAMU systems.

The FAJS and FACT ATCC stated that TMI amendments due to inclement weather are not anticipated adequately by the CAMU and, in addition, arrival rates and departure rates are not amended (compression) as conditions change. The working hours of the CAMU could contribute to this.

With the demand at FALE being so low it was questioned why a TMI is run seven days a week.

There is a general lack of understanding of ATFM/CDM both in the ACSA and ATNS environments, particularly regarding slot allocation. Many questions were asked about airport and ATC slot allocation procedures by both organizations. The nature of the questions indicates a lack of understanding. It was suggested that regular briefing sessions between sections/departments would be helpful to share information about the operation of the CAMU and identify opportunities for improvement.

Neither FACT nor FALE see the benefits (beside slot compliance) of insisting that departing flights comply with CTOT when the destination is to an aerodrome where no TMI is in place. It was stated that slot compliance takes precedence over tactical manipulation of traffic, resulting in possible inefficient operations.

All ATCCs stated that, on occasion, they will observe on the CAMU Web a changed CTOT for a flight already taxing for departure. In these instances, they do not hold the aircraft for departure to meet the new CTOT but will let it depart. The implication is that the slot compliance is impacted. It was suggested that there should be a time prior to departure after which the CTOT cannot be amended. In a related note, during the meeting with AASA, it was very strongly stated that airlines cannot accept changes in Airport Arrival Rates (AAR) or Airport Departure Rates (ADR) that result in changes to CTOTs at short notice.

The Metron Team learned that the CAMU Web is a rich source of information, yet during the FAJS AMC visit, it was not visible on the overhead screens at any time. In contrast, FACT AMC stated that they used it extensively for situational awareness, and times reflected on it were very accurate. It plays an important part in the Airport – CDM.

ACSA place a high value on having the CAMU staff in the AMC; however, the CAMU will only staff the AMC when staffing numbers allow.

No official post event analysis is carried out for daily TMI's or when major constraints are encountered resulting in amendments to arrival and/or departure rates.

FAJS ATC staff acknowledged the effectiveness of the demand and capacity management capability of the CAMU; however, it was suggested a workshop should be held to reassess what has been effective and what has not been effective.

FACT ATC requires more education on ATFM/CDM principles and suggested that it should be part of the ATC training curricula.

It was noted that there is a staff shortage of ATFM in the CAMU, leading to many of the issues stated above.

4.5.2 Technical Meetings

Meetings were held with technical staff at all three locations. The following common problems were discussed.

Access to airside to repair or replace Communication, Navigation, and Surveillance (CNS) equipment is often delayed, as no priority is given to engineers. This has an impact on their ACSA service level agreements, which requires rectification within 30 minutes.

At FAJS, airfield maintenance staff members are not trained adequately with regard to an acceptable proximity to ILS facilities, for example, during grass cutting. Technicians often have difficulty getting to remote ILS sites on the airfield due to bad road maintenance.

Difficulty is experienced in carrying out equipment calibration because of traffic levels (particularly FAJS). The lack of reliable and suitably-equipped SACAA aircraft is leading to inefficiencies. Aircraft are not serviceable at the required calibration times and when they do become available, ATC is forced to accept calibration at non-optimal times. The engineers requested that international best practice be investigated regarding equipment calibration (how busy airports manage it in the rest of the world) and, if required, institute these procedures in SA.

While their communication with ACSA is generally good, ATNS engineers have the impression that ACSA treats them as contractors; a “partnership” approach would be more effective.

5 Financial and Procurement Findings

This section provides an overview of the discussions regarding ATNS's and ACSA's finances and procurement processes.

5.1 Meetings

The objective of these meetings was to gain an understanding of what the finances and procurement processes are and how they potentially impact, negatively or positively, the ability to deploy capacity increasing enhancements. There were three meetings held over the course of two weeks, and numerous documents were reviewed.

On 2 October 2012, the Metron Team met with the ATNS CFO, Moshabe Willliam Ndlovu, and Senior Manager CNS Planning, Carel Gersbach, to discuss the overall SA ACE Study and to introduce the Metron Team to ATNS financial management. ATNS confirmed that their financial condition is strong and that they have no reservations about the potential impact on ATNS of having to work with all stakeholders, including ACSA, or the status of the Regulatory Commission.

On 3 October 2012, Mr Gersbach reviewed ATNS's financial status and described the regulatory rate-setting process. It was decided that the most efficient approach would be to hold a joint meeting with both ATNS and ACSA to discuss possible approaches.

A meeting was held on 10 October 2012 to discuss the following:

- Financial regulations that affect ATNS and ACSA, including those that will take effect in December 2012.
- Overview of the current impasse regarding government regulation of ATNS and ACSA.
- On-going regulatory review process.

Based on those discussions, the participants suggested the following topics for further consideration:

- Set an investment threshold that triggers stakeholder consultation.
- Involve stakeholders in the process, and have them agree on a service standard that would form the foundation for selecting between different options for meeting that standard. ATNS and ACSA would develop different investment options to meet service standards.
- Include the regulator in the ACSA/ATNS/stakeholder joint consultative process to help the regulator understand the logic behind the investment decisions that were agreed on by all the parties.

Both ACSA and ATNS invest in a wide range of capacity improvements, some of which have significant lead times. The timing differentials are important to all stakeholders, including the contracting agency, because all stakeholders need to understand when investment decisions need to be made and the reason for that timing. As a result, it will be helpful for ACSA and

ATNS to incorporate investment "triggers" in the long term capital investment plans. These triggers will result in moving a project from the planning stage to active evaluation and implementation.

It was noted that the interests of the various stakeholders are not necessarily aligned. ATNS is owned 100% by the government; ACSA is owned 74.6% by the government, 20% by Airports Company (PTY) LTD (held for government employee pension funds), 1.2% by the ACSA Staff Incentive Scheme, and 4.2% by Empowerment Investors. Apart from the government, the other shareholders seek market returns on investment. In addition, interests of stakeholders may differ. Even passenger airlines may not be perfectly aligned – low cost carriers (LCC) require quick turn-around of aircraft and may push for higher schedule reliability than a network carrier such as South African Airways (SAA). Moreover, cargo carriers have different interests than passenger carriers.

The group also discussed the procurement process. The government issued new regulations pertaining to the black empowerment procurement guidelines in late 2011, which will take effect by year end 2012. During the discussion, ATNS expressed concerned that the new guidelines may require that it select a low-cost bidder that may not be capable of delivering the required high technology systems. This concern was based on the fact that the proposed guidelines define any bidder that scored over 85% on technical merits automatically meets the minimum standards, and then low cost is all that matters. ACSA believes that Request for Proposals (RFP) can be written to comply with this guideline without impacting delivery of the necessary capacity-enhancing equipment. ACSA is concerned about the longer term impact of this regulation on the lead times that this regulation may require and on bulk procurement.

5.2 Financial Findings

The majority of ACSA's and ATNS' capital is devoted to managing regulated monopolies in South Africa. The Airports Company Act of 1993, the Ministry of Transportation, and the Regulatory Commission require that such monopolies provide an attractive return on capital with low risk. Unfortunately, ACSA and ATNS have not been able to generate such a return for the following reasons: The absence of a generally accepted methodology for using non-regulated South African earnings to reduce the "appropriate" earnings targets of the regulated businesses.

- The absence of a generally accepted methodology of how to treat non-South Africa business.
- The absence of a generally accepted methodology for recognising the legitimate interests of the various stakeholders.
- The absence of a generally accepted methodology for handling the sale of surplus assets.
- The absence of a generally recognised methodology for motivating ATNS and ACSA to be efficient.
- The need for ATNS and ACSA to offer competitive wages and career paths for their highly skilled workers and management, because these individuals are in demand throughout the world.

ACSA's financial strength was impaired due to the massive airport infrastructure investments that were made to accommodate expected increases in traffic including the upturn created by the World Cup in 2010. The lessons learned from this event can be used to develop good financial policy for similar circumstances in the future.

The Minister of Transport has started the process of changing the regulatory system. It is clear that going forward a broader group of stakeholders will be involved in influencing capacity enhancement investment decisions and that ATNS and ACSA will benefit from improved coordination of capacity enhancement initiatives. ACSA's and ATNS's ability to provide safe and efficient aviation infrastructure in South Africa requires that they continue to manage their businesses by focusing on safety first and not have concerns about how those decisions affect their financial well-being. This collaborative process should increase mutual understanding among all stakeholders. One challenge will be to find a way to create a means for constructive engagement that improves understanding.

Effective collaboration should enable both ATNS and ACSA to improve the efficiency of their combined operations when efficiency is defined as increasing the amount of service the system (ATNS and ACSA combined) provides based on a certain amount of capital and labour. The challenge will be to foster an environment in which the goal of maximising the system's efficiency without regard to whether ATNS or ACSA benefits from the improvements, and to design a system in which operational improvements are recognised by allowing for higher profits. This beneficial result will require mutual good will among all the parties—ATNS, ACSA, the airlines, and the regulator.

It is important to all stakeholders, as well as the national interest of South Africa, that ATNS and ACSA continue to make use of the core competencies. Capacity expansion will provide a growing number of skilled jobs, increased commerce in South Africa, and improved aviation infrastructure throughout Africa. The challenge for the regulator will be to find a way to provide equitable benefits (rate relief) to the users of the regulated infrastructure, and for capital and labour that is used by both the regulated and unregulated parts of the businesses. Because non-regulated businesses are significant to both ATNS and ACSA, it is important to ensure that the risks and returns from these businesses do not penalise the returns that ATNS and ACSA earn from their regulated monopolies.

5.3 Procurement Findings

From the meetings with ACSA and ATNS management, it appears that both are satisfied by the level of response received from RFPs, and that neither has an interest in the study evaluating its procurement practices. Based on this, it is proposed that the study review the latest procurement regulations that will go into effect at the end of 2012 to determine if they are likely to offer additional impediments to competitive bidding compared with the existing regulations.

6 Document and Data Review Summary

This study requires a significant amount of data and documentation to support the analyses needed to assess capacity enhancing capabilities for FAJS, FALE, and FACT. Task 1 includes the collection and review of the information received. This section is a high level accounting of the information received. At the time of this writing, the Study Team is still receiving and reviewing information.

During the site visits, the Team learned that some of the requested information was not necessary after we received clarification for each tasks. The subsequent sections provide a listing and a brief summary of the contents of the information received to date. Document and data review is an on-going exercise for this Study; consequently the Team will continue to review and request information as needed. The following is an extensive list of what has been collected with a brief summary of the contents or nature of the material.

6.1 Airspace Data and Documentation

- FACT PBN approaches—Maps illustrating proposed PBN approaches were received. These approaches are part of a set of capacity enhancing capabilities to be considered further.

- Radar data—Radar data will be used to evaluate actual aircraft routing in South African airspace. The full data request is still pending.

- Total Airspace and Airport Modeller (TAAM) models—The models are used to review current procedures and traffic flows, and will be used to evaluate capacity enhancing capabilities.

- Airspace maps—Mapped airspace elements were provided in different formats to illustrate airspace layouts across all of South Africa. The Team received specific TMA maps, KMZ file for the entire country, and SID/STAR maps.

- Route matrix—The route matrices provide standard routing between origin and destination pairs.

- AFT data –Flight schedule and CTOT data for the airports in the study. The full data request is still pending.

- Standard Operating Procedures —ICAO separation standards used to sequence aircraft that impacts demand on approach.

6.2 Airport Data and Documentation

- **Airport noise contours and reports**—The Noise Contour Reports and the noise contour files will be used as reference to consider the possible range of areas that may be impacted by increases in operational capacity. FALE has no calculated existing noise contours, and the future forecast contours from the reports vary significantly in forecast year and area from the contours presented in the CAD and Shape files. Therefore, the most wide reaching contours resulting from the combined overlap for each airport will be used to identify the potential area for consideration of land use compatibility and noise impacts when assessing the potential capacity enhancements.

  - **FACT ACSA 2011 Aircraft Noise Contours Report**– includes Integrated Noise Model (INM) calculated contours based on 2011 historic flight operations data and 2016 forecast flight operations.

  - **FAJS ACSA 2011 Aircraft Noise Contours Report**—includes Integrated Noise Model (INM) calculated contours based on 2011 historic flight operations data and 2016 forecast flight operations.

  - **FALE ACSA 2011 Aircraft Noise Contours Report**—includes INM calculated contours for 2016 forecast flight operations.

  - CTIA Noise Contours (Shape files)

  - CTIA—x-noise contour_2035.dwg (CAD file)

  - KSIA—Noise Contours (Shape files)

  - X-JIA-Noise contours Ultimate phase 4rwys.dwg (CAD file)

Airport Operational Data

- Operational Airport Statistics, 2004–2012 (Excel files received from ACSA)

  - CPT (19 files: 2 files each for years 2004 through 2012 with 3 for 2007)

  - DUR (15 files: 1 file each for 2005, 2005, 2012) with 2 files each for years 2006 through 2010)

  - JNB (18 files: 2 files each for years 2004 through 2012)

  - AC Type Per Stand.xlsx - File has a tab for each of the three airports, with rows that identify Aircraft stands and aircraft types assigned to each stand.

The Operations data includes flight records by gate, apron, arrival, departure, and aircraft information organised by date and time. This data will be used to understand typical operations as input for the Technical Analysis of airport efficiency enhancements.

- **FACT ROT and taxi time data**—(24 files received) Data was received for six airline operators at FACT. This information will be used in assessing possible improvements to taxiway routes and enhancements of the existing taxiway network.

- **Central Airspace Management Unit Network Operations Report**, August 2012—detailed 47 page overview of operational statistics for FAJS, FACT and FALE, including traffic volumes, delays, CTOT compliance.

- **CAA Resource Charts**—downloaded from the CAA.SA.com site –full sets of Jeppesen charts for each of FAJS, FALE, and FACT. These will be used to identify potential areas that could be impacted by creation of new routes or procedures.

  - Cape Town ATNS—Metron FACT.ppt—presentation prepared for meeting 11102012, contained an overview of operations and issues related to the airport operation and airfield restrictions.

- ACSA_KSIA Development Plans October 2012—presented 9 October 2012

- ATNS_King Shaka Airport (FALE) Runway OCC trial's Report 10 June 2012—presents statistical data on runway occupancy at FALE with relationship to challenges of the airfield.

Airport Vicinity Planning files (received ACSA and their planning consultants)—the list of documents below will be used to establish the range of areas and context for the Task 5 List of Potential Environmental Effects related to increases in capacity.

- **CTIA Vicinity Planning Documents**

  - Integrated Development Plan Draft Review 2011/12—City Council from City of Cape Town C 05/02/11 – outlines 8 strategic focus areas, the revenue and expenditure framework and the 5-year scorecard

  - Tygerberg District Plan Posters –summary overview of the special concepts for Economic opportunities, Environmental Protection and Sub district development guidelines.

  - Tygerberg District Plan Volume 1 Baseline Information and Analysis Report March 2011—summarised Natural Environment and Resource Baseline data and Management Priorities.

  - Tygerberg District Plan Volume 2 Strategies, Proposals and Implementation Framework March 2011—summarised Key Spatial Strategies, District Development Guidelines, Impact Zones and Framework for Public Investment.

  - Tygerberg District Plan Volume 3 Public Comments and Responses Report March 2011—summarised the Overview of Issues and the way forward.

  - District Plan jpgs

  - SubDistrict maps 1 through 9 jpgs

  - Tygerberg Environmental Management Zone images:

    - Biodiversity

- Culture
- Economic
- Hydrology
- Utility

- City of Cape Town Planning and Environmental Portfolio Committee: 2 June 2009 Strategy and Planning recommendations for 2009/2010 Directorate Service Delivery and Budget Implementation Plans and Business Plans—includes the standard Environmental Implications check list, specific plan objectives for and indicators including performance targets for the
  - Strategic Development Information and GIS Department
  - Environmental Resource Management Department.
  - Planning and Building Development Management Department
  - Spatial Planning and Urban Design Department
- ACSA CTIA files:
  - CTIA Aerial Locality 111012.pdf
  - CTIA Airside Capacity Study Presentation 12102012.pdf
  - CTIA_LAND USE PLANNING REVIEW_12102012_rev2.pptx

- KSIA Vicinity Planning documents:
  - AgriZone Precinct Plan 5 February 2010 –
  - Airport Precinct Plan 19 December 2007_Approved
  - Dube TradePort Development Framework Plan revision 3 updated 05022008 final approved
  - Dube TradePort Dube City Support Precinct 1: Northern Sub-precinct Precinct Plan (Revision) 31 January 2012 draft
  - Dube TradePort TradeZone 1 Precinct: (South Eastern Sub-Precinct) Precinct Plan 19 December 2007 approved.
  - Dube TradePort TradeZone 2 Precinct: (South Eastern Sub-Precinct) Precinct Plan 19 December 2007 approved.
- ORTIA Vicinity Planning documents:
  - ORTIA Notes from ACS interaction with the Airlines—presentations from the workshop held on the 21st of June 2012

- ORTIA: Airside Capacity Outlook and Possible Future Developments (Erik Kriel)
- Airside Operational Constraints ORTIA
- Remote Apron Stands (RAS)
- ATNS Operational Enhancements OT Tambo

- Regional Spatial Development Framework for EMM Region A 17 September 2012—plan done for Ekurhuleni Metropolitan Municipality
- O.R. Tambo International Airport Master Plan and Orientation October 2012 ACSA—overview of Aerotropolis and integration with Airport Master Plan.

Airport drawings—Existing airport development drawings (CAD files) were provided for ORTIA, KSIA and CTIA by ACSA. Master Plan facilities drawings were also provided for ORTIA and CTIA. These will be used to assess the potential for use efficiency enhancements within the existing facilities, as well as the potential for interim phase development which may achieve better airfield and apron utilization with minimum capital improvements.

- Airfield drawing sets:
  - CTIA Drawings (174 files including 73CAD files)—2010, 2015, 2025 plans
  - KSIA Drawings (42 files including 1 CAD file)—existing conditions
  - ORTIA Drawings (55CAD files)—existing and 55 MAP plans
- Terminal Precinct drawings :
  - CTIA: Terminal Area Drawings (6 CAD files)
  - CTIA: Roads Drawings (7 CAD files)
  - KSIA: Terminal Building Drawings (7 CAD files)
  - ORTIA security fence line.dwg
    - ORTIA: Terminal Building Floor Layouts)

6.3 Finance Data and Documentation

- "Airports Company Act, No. 44 of 1993"—This is the act that transferred control of nine airports from the government to the newly created independent company ACSA.
- "Approach to the 2010/11 – 2014/15 Permissions"—This document was provided by the Regulating committee for Airports and ATNS Companies and published April 2009. It details the user charges for the services provided by ATNS (which form ATNS revenue) between 2011 and 2015.
- "ACSA Aviation Traffic Forecasts 2011 – 2035" produced by Mott MacDonald, dated January 2012—This contains detailed traffic forecasts for ACSA's airports through 2035.

- "Department of Transport, Republic of South Africa Development of the Funding Model for Airports Company South Africa and Air Traffic and Navigation Services Company", by Cambridge Economic Policy Associates, Ltd, April 30, 2012—This consultant report was commissioned by the Department of Transport to advise on addresses changes to the regulatory funding model for ACSA and ATNS.

- ATNS Annual Reports 2011 and 2012—annual reports to shareholders containing operating and financial information.

- ATNS Forecast of Financial Performance (undated) which contains the profit/loss accounts, balance sheets, and cash flows for the three fiscal years 2012/13, 2013/14, and 2014/15.

- National Gazette Notice 918, 30 Dec 2011, Volume 552 – Publication of Air Traffic Service Charges—It details the user charges for the services provided by ACSA (which form ACSA revenue).

- ACSA Annual Reports 2011 and 2012—annual reports to shareholders containing operating and financial information.

- "Economic impact study of all the airports managed by ACSA", produced by KPMG for ACSA, dated June 11, 2012—This quantifies the contribution made to the South African economy by ACSA's airports.

- National Gazette No 34411, 30 June 2011, Volume 552 – Airport User Rates—It details the user charges for the services provided by ACSA.

6.4 Procurement Data and Documentation

- "Implementation Guide Preferential Procurement Regulations, 2011 Pertaining to the Preferential Procurement Policy Framework Act, Act No. 5 of 2000", dated Dec 1, 2011, published by the National Treasury—which is a guide to procurement officers on how to apply the new procurement regulations that come into effect in December 2012.

- Government Gazette No. 9544, vol 552, June 2011—which contains the updated Preferential Procurement Policy Act.

- RFP: LOA1509/2012, Appointment of a Suitable Financier to Provide Loan Facility for ATNS Capital Investment, 28/09/2012—This RFP was issued by ATNS in order to obtain a financier to provide loans for future ATNS capital investments.

7 Conclusions and Next Steps

The purpose of SA ACES is to evaluate the feasibility of selected airspace and airside capacity and efficiency enhancements that address the operational needs of ATNS and ACSA. Task 1 is the basis for the study and as such, ATNS and ACSA feedback on this report are essential to the overall success of this study. The observations herein should be reviewed for accuracy and consistency, and modified as needed.

As stated in Section 2, the Task 1 objectives are to:

1. Establish working relationships with ATNS, ACSA, and other stakeholders.

2. Gather relevant airside and airspace data and information and gain an understanding of current and future operations for use in future tasks.

3. Gain support for the initial plan and proposed methodologies for future tasks.

The Metron Team was successful in establishing the working relationships with ATNS and ACSA as evidenced by the open dialogue that has continued since the kickoff meetings. The site visits and meetings were effective in establishing an understanding of airspace and airside operations at FAJS, FALE, and FACT. Additionally, the collection and review of relevant data and information is in progress at the time of this writing, and will continue as required. The kickoff meeting was productive in gaining support and clarification for the initial plans and methodologies. Finally, the lessons learned will be incorporated in the future tasks.

The previous sections discussed the unique operational challenges in the airspace and at the airport that impact the ability to increase efficiency and capacity at FAJS, FALE, and FACT. FAJS airspace challenges are characterised by a variety of factors: additional demand from satellite airports (e.g. FALA), military restrictions on the use of the airspace, a fleet mix representing a wide variety of wake categories, need to share the airspace with recreational users, lack of situational awareness of the airspace of neighbouring countries, capacity management practices, lack of collaboration, and human resource shortages.

FAJS airport operations are primarily impacted by the runway layout and location of the airport terminal complex. These necessitate runway crossings and their required procedures, excessive ROTs, and surface congestion along the taxiways. Among many of the operational concerns, aircraft pushing back from the remote stands interfere with aircraft taxiing on the parallel taxiway, and the lack of departure runway hold pads limit ATC's ability to optimally sequence departures. Finally, FAJS master plans to improve these shortfalls will require significant capital expenses.

FALE airspace experiences similar challenges to FAJS: capacity management practices, training and VFR operations at FAVG, and a fleet mix representing a wide variety of wake categories. The most prominent airside challenge at FALE is the "hot spot" located at the intersections of taxiways Golf, Alpha, and November, which leads to increased taxi times during periods of peak demand. South flow operations at FALE result in long taxi times for departing aircraft due to the southern location of the terminal building. However, north flow operations result in long taxi times for arrival aircraft. Additionally, single-access taxiways, and the lack of GA facilities lead to further inefficiencies, especially during major events.

FACT airspace is characterised by a large amount of VFR traffic along with a mixed fleet of aircraft that pose sequencing challenges for ATC. The available airspace is further constrained by the mountainous terrain and military operations. As with FAJS and FALE, FACT's capacity is limited because of the physical constraints of the airfield and the resulting procedural complications. As capacity increases, the single taxilane layout, sub-optimal number and layout of RETs, and the lack of arrival and departure holding pads will lead to increased ROTs, taxi times, and arrival and departure delays. Finally, hot spots, line-of site issues, gate allocation issues, and the amount of and location of airside real estate afforded to unscheduled aircraft may lead to increased delays and reduced operational efficiency.

There are two common challenges that were identified in site visits to all three regions. One of those challenges is capacity management. Observations revealed the need to reassess how AFPs are applied as a fix for airport demand, for example instituting an AFP in the FAJS TMA because of demand at FALA. Additionally, the AFT does not take into account wake turbulence separation requirements between successive departures. Miscommunication between CAMU and the facilities limits the effectiveness of TMIs or results in the use of a TMI when it is not necessary. Finally, the lack of training on ATFM/CDM and additional staff to help facilitate capacity management activities limits operational efficiency.

Technical staff at all three facilities are faced with similar challenges: airfield maintenance interferes with ILS operations; equipment is located in remote areas with less than adequate means of access; traffic levels impact the ability to conduct equipment calibration with regular frequency; there is a need for a more collaborative working relationship between ATNS and ACSA; and technicians do not have quick access to the airfield in normal or emergency situations.

The financial research on ATNS and ACSA indicated that the Minister of Transport's decision to conduct the Oxford Study was important and timely. Both companies require a regulatory regime which reflects the complexity of their current global businesses and provides appropriate and predictable returns on their core regulated monopolies. The Study Team provided all stakeholders with a forum for discussing these issues.

ATNS and ACSA have become global leaders in their respective businesses, and South Africa benefits from their excellence. However, this leadership cannot be maintained unless both are allowed to charge fees on their regulated businesses which provide appropriate compensation for their investments while leaving both companies free to earn market returns on their non-regulated businesses.

The research also indicated that financial implications of capacity enhancement decisions should be understood by all stakeholders, prior to decisions being made. This collaborative process should work to the benefit of all stakeholders.

The critical importance of balance and collaboration between the airspace and airport elements of the system was further reinforced as a fundamental theme throughout the discussions within each airport. It is recognised that an efficient system requires that the airspace system and the airport system work in harmony, thereby enabling all parties to efficiently serve demand while minimising environmental impacts, capital costs, and operating expenses.

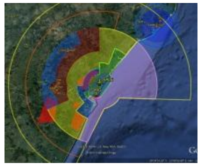
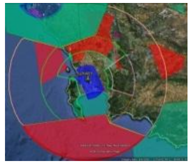
As we move forward, the issues relating to each airport will be further reviewed and assessed. The issues and potential solutions carried forward will include those identified by the ATNS/ ACSA Airside Capacity Enhancement Initiatives list, as well as those observed directly by the team during the site visits and reconnaissance. Subsequent analyses (Task 2) will include the identification of capacity shortfalls and metrics, analysis of weather, historical and forecast traffic activity, examination of capacity enhancements and their impacts, and the development of models to assess their benefits. The Metron Team will submit more detailed methodologies and analyses for Task 2, Task 3, and Task 5 immediately following the submission of this report in order to gain approval from ATNS and ACSA.

The cooperation and collaboration between and among the study team and ATNS/ACSA during the execution of this initial task has established a solid foundation for the successful completion of the balance of the study. The material presented herein, including subsequent comments, corrections, and additions provided by ATNS and ACSA, will be considered and applied as the team embarks on Task 2, 3, and 5 to fulfil the tactical and strategic objectives of this study.

Appendix A Airspace and Airside Summaries

Table 9 and Table 10 summarise the airspace and airside findings for FAJS, FALE, and FACT.

Table 9: Airspace Summary

Item	FAJS	FALE	FACT
Overview	Busiest airport in Africa; SA air transport hub	Popular domestic tourist destination; busy cargo operations	2nd largest and busiest airport in South Africa; 3rd busiest in Africa
Airspace Design			
Airspace Class	Class C[9]	Class C	Class C

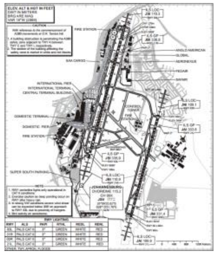
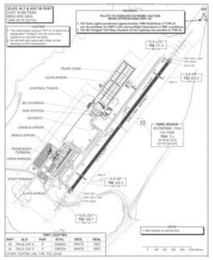
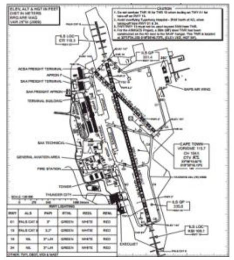
[9] Class C airspace – Operations may be conducted under IFR, SVFR, or VFR. All aircraft are subject to ATC clearance. Aircraft operating under IFR and SVFR are separated from each other and from flights operating under VFR, but VFR flights are not separated from each other. Flights operating under VFR are given traffic information in respect of other VFR flights.

Item	FAJS	FALE	FACT
Airspace and ATC Operational Characteristics	• FALA operations increasing the demand on the TMA • Lower than needed level of RNAV equipage • ATC staffing • Lack of collaboration • Lack of shared radar data with neighbours • CTOT management • Fleet mix • No VFR flight permitted in the FAJS	• Interactions with operations at FAVG • CTOT management • Fleet mix • IFR training	• Mountainous terrain limits airspace capacity. • Military airspace limits airspace capacity. • Interactions with high volumes of VFR traffic in the TMA. • CTOT management • Fleet mix • GA operations
Airport Interactions	FALA, FAGC, FAGM, FASK, FAWK, FAWB	FAVG, FAPM, FARB	FAYP, FALW

Item	FAJS	FALE	FACT
CAMU	• Ineffective use of AFP in the FAJS TMA when demand exceeds the capacity due to FALA demand • AFT does not take into account the necessary wake turbulence separation requirements between successive departures • No clear communication plan with ATC to effectively manage anticipated adverse conditions • TMI amendments due to inclement weather are not anticipated adequately by the CAMU • Arrival and departure rates are not amended (compression) as conditions change • Inconsistent and infrequent use of CAMU Web • CTOT is changed while aircraft in departure taxi leading to non-compliance • Need additional training on ATFM/CDM • Staffing shortage	• AFT does not take into account the necessary wake turbulence separation requirements between successive departures • Inconsistent and infrequent use of CAMU Web • CTOT is changed while aircraft in departure taxi leading to non-compliance • Need additional training on ATFM/CDM • Staffing shortage	• AFT does not take into account the necessary wake turbulence separation requirements between successive departures • TMI amendments due to inclement weather are not anticipated adequately by the CAMU • Arrival and departure rates are not amended (compression) as conditions change • Departing flights forced to comply with CTOT when the destination is to an uncontrolled aerodrome • Inconsistent and infrequent use of CAMU Web • CTOT is changed while aircraft in departure taxi leading to non-compliance • Need additional training on ATFM/CDM • Staffing shortage
Restricted Areas (FAR)	• Heystekrand • Wallmansthal Weapons Range • Transvaal Military Middle Flying Area • Boskop Munitions Factory • Sasolburg • Secunda • Potchefstroom Military Shooting Range	• Durban Harbour	• Langebaanweg Military Flying Area • Touws River Weapons Training Area • Koeberg Nuclear Power Station • Table Bay Harbour • Simons Town • Cape of Good Hope Nature Preserve • Vals Bay • Overberg

Item	FAJS	FALE	FACT
Danger Areas (FAD)	• Nylstroom Flying Training Area • Magaliesberg Flying Training Area • Brits/Grand Central Flying Training Area • Pretoria Flying Training Areas I and II • Johannesburg Flying Training Area • Johannesburg Helicopter General Flying Area • East Rand Flying Training Area • Pienaars River FAR82 • Hartebeespoort Danger Area	• Pietermaritzburg Flying Training Area • Durban/Virginia General Flying Area • Durban/Virginia Helicopter General Flying Area • Nshongweni Military Helicopter Flying Training Area	• Stellenbosch General Flying Area • West Cape Fleet Training Area • Cape Town Maritime Flying Training Area • Worcester/Robertson General Flying Area • Ysterplaat Military Helicopter Mountain Flying Area • Cape Town Flying Training Area • FALW MIL low Flying area
Prohibited Areas (FAP)	• Voortrekker Monument • Pelindaba		• Firgrove • Krantzkop
Geographic Location	NE Inland	NE Coast	SW Coast
International Border	Namibia, Botswana, Swaziland	Oceanic	Oceanic
Weather	Summer afternoon thunderstorms	Wind, low ceilings	Wind, low ceilings
Terrain			Mountains of the Western Cape

Table 10: Airport Summary

Item	FAJS	FALE	FACT
Layout			
Location	~25km NE of Johannesburg	~33km NE of Durban	~18km SE of Cape Town
Capacity	• 60 • TMA: 88	• 24 • TMA: 34	• 30 • TMA: 35
Airside Characteristics	• Runway use and procedures • Runway crossings • Sub-optimal RETs • Lack of hold pads • Lack of bypass taxiways	• Hot spot • One-way in/out aprons • GA activity • Lack of apron space for major activities	• Single taxi-lane for A, B, and C aprons • Lack of parallel taxiway • Lack of RETs • Airfield hotspots • Lack of holding pads • GA activity • Intersection departures • Aircraft gate limitations • Alignment of CAT I/II holding lines
Airport Configuration	North/South	North/South	North/South
Technical maintenance	• Interference with ILS • Need for increased collaboration between ATNS and ACSA	• Impeded access to airfield • Need for increased collaboration between ATNS and ACSA	• Impeded access to airfield • Need for increased collaboration between ATNS and ACSA

Appendix B Kickoff Meeting Slides

Study Objective

- **The objective of this study is to:**
  - Evaluate the feasibility of utilizing capacity enhancements for:
    - Airspace
    - Airside
  - Prioritize capacity enhancements, taking the following into consideration:
    - Existing and advanced technologies and procedural improvements
    - Infrastructure improvements
    - Training
    - Aircraft operator avionics & performance
  - Identify efficiency gains for identified improvement
  - Identify trigger points for initiating capacity enhancement initiatives
  - Develop a joint ATNS-ACSA roadmap

Task 1: Kickoff Meeting, Work Plan, Document Review, & Site Visits

- **Objective: Collect information that will provide the foundation for all subsequent tasks**
  - Kickoff Meetings & Site Visits: 1-13 October
  - Work Plan to be coordinated based on deliverables and response times
    - ACSA, ATNS, and other stakeholders will have two weeks from report delivery date to respond with comments/questions. ACSA & ATNS will consolidate all feedback and deliver to the Metron Team
    - Metron Team will respond appropriately to feedback
    - All deliverable dates are baseline and are subject to change based on the review schedule
  - Document Review in progress and will continue as more items become available
    - Team will provide a list of outstanding documents and data
- **Gather input from ATNS & ACSA on overall goals and objectives**
  - Include additional stakeholders in reviews and discussions. These will be coordinated by ACSA/ATNS
- **Collect data and information that lead to more thorough understanding of task and help meet identified goals and objectives**
- **Deliverable: 12 November 2012**

Task 2: Technical Analyses

- **Objective: Validate the proposed capacity enhancements by:**
  - Calculating the capacity gains afforded by the proposed capacity enhancements
    - Identifying the shortfalls being addressed by proposed capacity enhancements
    - Identifying operational improvements/risks/impacts
  - Assessing Technical Feasibility
    - Gather relevant technology data: CNS, separation, sequence, aircraft performance, etc.
  - Identifying policy and procedural improvements/risks/impacts
    - Gather operational data related to procedures & policies: surface movements, sequencing, communications, dependent operations, communication processes, etc.
  - Analyzing proposed enhancements and identifying potential alternatives
    - Review capacity improvements
    - Research other airports with similar improvements and estimations of future capacity gains
    - A comparison between the two methods should show an envelope of capacity gains
  - Establishing appropriate metrics for establishing costs and benefits
- **Deliverable: 14 January 2013**

Task 3: Economic and Financial Analyses

- **Objective: Understand the regulatory framework governing the financial objectives of ATNS and ACSA**
  - Understand the rates and charges regime that influences funding eligibility for various types of projects
- **Understand the issues that are important to the various stakeholders**
- **Understand the financing regulations of each organization and government department and how that influences ATNS & ACSA**
- **Incorporate financial recommendations into operational analysis where appropriate**
- **Suggest ways of aligning financing policies of organizations with the needs of the stakeholders and the economic regulator**
- **Deliverable: 14 February 2013**

Task 4 – Institutional, Legal, Regulatory, and Procurement Practices

- Objective: Develop a sufficient understanding of the laws and regulations that enable the identification of recommendations to promote increased competition between qualified suppliers
- Document practices, laws, and regulations that will impede successful implementation of capacity enhancements
- Deliverable: 16 January 2013

Task 5: Preliminary Environmental Impact Assessment

- Objective: Evaluate the environmental effects of the recommended airside and airspace capacity enhancements
- Define environmental airport study areas and associated terminal airspace
- Review existing environmental constraints and issues for each airport vicinity and terminal airspace environs
- Identify environmental issues of the proposed capacity enhancements relevant to each individual airport
- Recommend mitigation strategies
- Deliverable: 18 December 2012

Task 6: Specifications & Recommendations

- Objective: Provide a set of recommendations and specifications describing each capacity enhancement that meet the combined ATNS-ACSA objectives based on the results of the preceding tasks
- Proposed recommendations will incorporate rules of aggregation among the capabilities
- Output will be used for operational and financial planning
- Deliverable: 29 January 2013

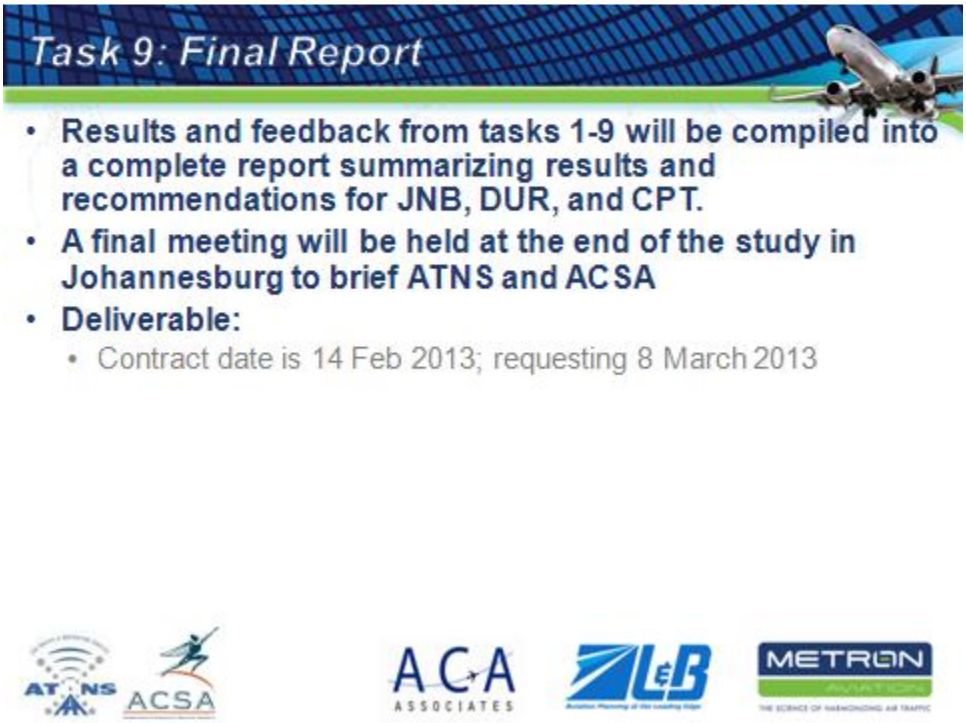
ATNS ACSA ACA ASSOCIATES L&B METRON AVIATION

Task 7: Development Impact Assessments

- Objective: Assess the benefits of the recommended airside capacity enhancements by identifying impacts of:
  - Development and implementation on infrastructure,
  - Human capacity building,
  - Technology transfer and productivity enhancement, and
  - Other identified components
- ATNS/ACSA to supply Metron Team with further input
- Deliverable: 18 December 2012

ATNS ACSA ACA ASSOCIATES L&B METRON AVIATION


Task 8: Implementation Plan
• Objective: Develop a comprehensive, flexible, and scalable plan to assist ATNS and ACSA with implementation of the recommended airside capacity enhancements. Plan will include:
• Activities
• Procedural enhancements
• Technological enhancements
• Estimated order of magnitude costs
• Human resources
• Goods and services
• Sequencing
• Demand triggers (with consideration of lead time requirements)
• The success of the plan is based on the participation of the stakeholders
• Deliverable: 23 January 2013


Task 9: Final Report
• Results and feedback from tasks 1-9 will be compiled into a complete report summarizing results and recommendations for JNB, DUR, and CPT.
• A final meeting will be held at the end of the study in Johannesburg to brief ATNS and ACSA
• Deliverable:
• Contract date is 14 Feb 2013; requesting 8 March 2013

Appendix C Meeting Attendees

Meeting Date	Meeting Description	First	Last	Organisation
1-Oct-12	Kickoff	Yazeed	Abrahams	ACSA
1-Oct-12	Kickoff	Chris	Ermatinger	Metron Aviation
1-Oct-12	Kickoff	Sanjeev	Gareeb	ACSA
1-Oct-12	Kickoff	Carel	Gersbach	ATNS
1-Oct-12	Kickoff	Doug	Goldberg	Landrum & Brown
1-Oct-12	Kickoff	Howard	Hawke	ATNS
1-Oct-12	Kickoff	Adele	Klingenberg	ACSA
1-Oct-12	Kickoff	Erik	Kriel	ACSA Corp
1-Oct-12	Kickoff	Taryn	Lewis	Metron Aviation
1-Oct-12	Kickoff	Josia	Manyakoana	ATNS
1-Oct-12	Kickoff	Peter	Marais	ACSA
1-Oct-12	Kickoff	Jeoff	Matshoba	ATNS
1-Oct-12	Kickoff	Ramesh	Motilal	ACSA
1-Oct-12	Kickoff	Sthembiso E.	Ngobese	ACSA
1-Oct-12	Kickoff	Stuart	Ratcliffe	Metron Aviation
1-Oct-12	Kickoff	Kris	Reddy	ACSA
1-Oct-12	Kickoff	Shaheed	Regal	ACSA
1-Oct-12	Kickoff	Hein	Reid	ATNS
1-Oct-12	Kickoff	Donald	Schenk	ACA Associates
1-Oct-12	Kickoff	Jennifer	Smith	ACSA
1-Oct-12	Kickoff	Sheila	Thomas	Landrum & Brown
1-Oct-12	Kickoff	Sonelle	van Voorst	ACSA
1-Oct-12	Kickoff	Justeyn	Van Zyl	ACSA
1-Oct-12	ACSA-FALE	Erik	Kriel	ACSA
1-Oct-12	ACSA-FALE	Sanjeev	Gareeb	ACSA
1-Oct-12	ACSA-FALE	Taryn	Lewis	Metron Aviation
1-Oct-12	ACSA-FALE	Chris	Ermatinger	Metron Aviation
1-Oct-12	ACSA-FALE	Stuart	Ratcliffe	Metron Aviation
1-Oct-12	ACSA-FALE	Doug	Goldberg	Landrum & Brown
1-Oct-12	ACSA-FALE	Sheila	Thomas	Landrum & Brown

Meeting Date	Meeting Description	First	Last	Organisation
2-Oct-12	ATNS-FAJS	Johnnie	Smit	ATNS
2-Oct-12	ATNS-FAJS	Dave	Joubert	ATNS
2-Oct-12	ATNS-FAJS	Leon	Altree	ATNS
2-Oct-12	ATNS-FAJS	Simon	Zwane	ATNS
2-Oct-12	ATNS-FAJS	Dhipak	Lalla	ATNS
2-Oct-12	ATNS-FAJS	Louis	Van Rensberg	ATNS
2-Oct-12	ATNS-FAJS	Ian	Herkes	ATNS
2-Oct-12	ATNS-FAJS	Marius	Van Schalkwyk	ATNS
2-Oct-12	ATNS-FAJS	Jose	Murta	ATNS
2-Oct-12	ATNS-FAJS	Sam	Mahlangu	ATNS
2-Oct-12	ATNS-FAJS	Ramona	Abrahams	ATNS
2-Oct-12	ATNS-FAJS	Taryn	Lewis	Metron Aviation
2-Oct-12	ATNS-FAJS	Chris	Ermatinger	Metron Aviation
2-Oct-12	ATNS-FAJS	Stuart	Ratcliffe	Metron Aviation
2-Oct-12	ATNS-FAJS	Doug	Goldberg	Landrum & Brown
2-Oct-12	ATNS-FAJS	Sheila	Thomas	Landrum & Brown
3-Oct-12	ACSA FAJS	Chris	Ermatinger	Metron Aviation
3-Oct-12	ACSA FAJS	Doug	Goldberg	Landrum & Brown
3-Oct-12	ACSA FAJS	Erik	Kriel	ACSA
3-Oct-12	ACSA FAJS	Taryn	Lewis	Metron Aviation
3-Oct-12	ACSA FAJS	Ramesh	Motilal	ACSA
3-Oct-12	ACSA FAJS	Sthembiso E.	Ngobese	ACSA
3-Oct-12	ACSA FAJS	Stuart	Ratcliffe	Metron Aviation
3-Oct-12	ACSA FAJS	Kris	Reddy	ACSA
3-Oct-12	ACSA FAJS	Donald	Schenk	ACA Associates
3-Oct-12	ACSA FAJS	Bradley	Stalls	ACSA
3-Oct-12	ACSA FAJS	Sheila	Thomas	Landrum & Brown
3-Oct-12	ACSA FAJS	Sonelle	van Voorst	ACSA
3-Oct-12	ACSA FAJS	Davina	Zietsman	ACSA
3-Oct-12	AASA	Chris	Ermatinger	Metron Aviation
3-Oct-12	AASA	Doug	Goldberg	Landrum & Brown
3-Oct-12	AASA	Howard	Hawke	ATNS

Meeting Date	Meeting Description	First	Last	Organisation
3-Oct-12	AASA	Dave	Joubert	ATNS
3-Oct-12	AASA	Erik	Kriel	ACSA
3-Oct-12	AASA	Taryn	Lewis	Metron Aviation
3-Oct-12	AASA	Matome	Ramokgobedi	SAA
3-Oct-12	AASA	Stuart	Ratcliffe	Metron Aviation
3-Oct-12	AASA	Donald	Schenk	ACA Associates
3-Oct-12	AASA	Sheila	Thomas	Landrum & Brown
3-Oct-12	AASA	Davina	Zietsman	ACSA
3-Oct-12	AASA	Chris	Zweigenthal	AASA
4-Oct-12	Ekurhuleni Municipality	Erik	Kriel	ACSA
4-Oct-12	Ekurhuleni Municipality	Marinda	Schoonraad	Metro Plan
4-Oct-12	Ekurhuleni Municipality	Pieter	Swanepoel	Ekurhuleni Municipality
4-Oct-12	Ekurhuleni Municipality	Sheila	Thomas	Landrum & Brown
4-Oct-12	ATNS FAJS	Jan	Van Antwerp	ATNS
4-Oct-12	ATNS FAJS	Chris	Ermatinger	Metron Aviation
4-Oct-12	ATNS FAJS	Doug	Goldberg	Landrum & Brown
4-Oct-12	ATNS FAJS	Uvesh	Gopichund	ATNS
4-Oct-12	ATNS FAJS	Howard	Hawke	ATNS
4-Oct-12	ATNS FAJS	Dave	Joubert	ATNS
4-Oct-12	ATNS FAJS	Taryn	Lewis	Metron Aviation
4-Oct-12	ATNS FAJS	Nomanzi	Nkala	ATNS
4-Oct-12	ATNS FAJS	Stuart	Ratcliffe	Metron Aviation
4-Oct-12	ATNS FAJS	Jean-Mari	Rossouw	ATNS
4-Oct-12	ATNS FAJS	Donald	Schenk	ACA Associates
4-Oct-12	ATNS FAJS	Sheila	Thomas	Landrum & Brown
5-Oct-12	ATNS-CAMU	Vincent	Mekwa	ATNS-CAMU
5-Oct-12	ATNS-CAMU	Armando	De Olim	ATNS-CAMU
5-Oct-12	ATNS-CAMU	Taryn	Lewis	Metron Aviation
5-Oct-12	ATNS-CAMU	Chris	Ermatinger	Metron Aviation
5-Oct-12	ATNS-CAMU	Stuart	Ratcliffe	Metron Aviation

Meeting Date	Meeting Description	First	Last	Organisation
5-Oct-12	ATNS-CAMU	Doug	Goldberg	Landrum & Brown
5-Oct-12	ATNS-CAMU	Sheila	Thomas	Landrum & Brown
8-Oct-12	ATNS/ACSA FALE	Shawn	Carr	ATNS
8-Oct-12	ATNS/ACSA FALE	Trevor	Du Plessis	ATNS
8-Oct-12	ATNS/ACSA FALE	Chris	Ermatinger	Metron Aviation
8-Oct-12	ATNS/ACSA FALE	Doug	Goldberg	Landrum & Brown
8-Oct-12	ATNS/ACSA FALE	Salon	Hlongwane	ATNS
8-Oct-12	ATNS/ACSA FALE	Dave	Joubert	ATNS TOR
8-Oct-12	ATNS/ACSA FALE	Taryn	Lewis	Metron Aviation
8-Oct-12	ATNS/ACSA FALE	Krish	Moodley	ATNS
8-Oct-12	ATNS/ACSA FALE	Stuart	Ratcliffe	Metron Aviation
8-Oct-12	ATNS/ACSA FALE	Sheila	Thomas	Landrum & Brown
8-Oct-12	ATNS/ACSA FALE	Leon	van Rensburg	ATNS
8-Oct-12	Umhlanga Town Planning	Cathy	Ferguson	The Planning Initiative
8-Oct-12	Umhlanga Town Planning	Justeyn	Van Zyl	ACSA Corp
8-Oct-12	Umhlanga Town Planning	Sheila	Thomas	Landrum & Brown
8-Oct-12	ACSA FALE	Sean	Van Der Valk	ACSA
8-Oct-12	ACSA FALE	Justeyn	Van Zyl	ACSA Corp
8-Oct-12	ACSA FALE	Taryn	Lewis	Metron Aviation
8-Oct-12	ACSA FALE	Chris	Ermatinger	Metron Aviation
8-Oct-12	ACSA FALE	Stuart	Ratcliffe	Metron Aviation
8-Oct-12	ACSA FALE	Doug	Goldberg	Landrum & Brown
8-Oct-12	ACSA FALE	Sheila	Thomas	Landrum & Brown
10-Oct-12	Finance	Ernest	Mwale	ATNS Corp
10-Oct-12	Finance	Dirk	Kunz	ACSA Corp
10-Oct-12	Finance	Carel	Gersbach	ATNS
10-Oct-12	Finance	Erik	Kriel	ACSA
11-Oct-12	ATNS FACT	Annis	Anderson	ATNS
11-Oct-12	ATNS FACT	Eric	Bancel	ATNS
11-Oct-12	ATNS FACT	Anton	Beukes	ATNS
11-Oct-12	ATNS FACT	Wendell	Cain	ATNS

Meeting Date	Meeting Description	First	Last	Organisation
11-Oct-12	ATNS FACT	Gavin	Cullen	ATNS
11-Oct-12	ATNS FACT	Phillip	De Lange	ATNS
11-Oct-12	ATNS FACT	Cinumzi A.	Dlamini	ATNS
11-Oct-12	ATNS FACT	Ferdinand	Engel	ATNS
11-Oct-12	ATNS FACT	Chris	Ermatinger	Metron Aviation
11-Oct-12	ATNS FACT	Greg	Fisher	ATNS
11-Oct-12	ATNS FACT	Dave	Joubert	ATNS
11-Oct-12	ATNS FACT	Taryn	Lewis	Metron Aviation
11-Oct-12	ATNS FACT	Ivan	Louw	ATNS
11-Oct-12	ATNS FACT	Rustin	Meyer	ATNS
11-Oct-12	ATNS FACT	Ntombenhle	Moeng	ATNS
11-Oct-12	ATNS FACT	Lazola	Qoza	ATNS
11-Oct-12	ATNS FACT	Sheila	Thomas	Landrum & Brown
12-Oct-12	FACT Vicinity Planning	Nisa	Mammom	NM & Associates
12-Oct-12	FACT Vicinity Planning	Jacqui	Ferreira	ACSA
12-Oct-12	FACT Vicinity Planning	Justeyn	Van Zyl	ACSA Corp
12-Oct-12	FACT Vicinity Planning	Sheila	Thomas	Landrum & Brown
12-Oct-12	ACSA FACT	Yazeed	Abrahams	ACSA
12-Oct-12	ACSA FACT	Blarat	Blickha	ACSA
12-Oct-12	ACSA FACT	Jacqui	Ferreira	ACSA
12-Oct-12	ACSA FACT	Marion	Kapot	ACSA
12-Oct-12	ACSA FACT	Adele	Klingenberg	ACSA
12-Oct-12	ACSA FACT	Mikkie	Miller	ACSA
12-Oct-12	ACSA FACT	Mlamleli	Mpeta	ACSA
12-Oct-12	ACSA FACT	William	Nel	ACSA
12-Oct-12	ACSA FACT	Shaheed	Regal	ACSA
12-Oct-12	ACSA FACT	Jennifer	Smith	ACSA
12-Oct-12	ACSA FACT	Justeyn	Van Zyl	ACSA Corp
12-Oct-12	ACSA FACT	Taryn	Lewis	Metron Aviation
12-Oct-12	ACSA FACT	Chris	Ermatinger	Metron Aviation

Meeting Date	Meeting Description	First	Last	Organisation
12-Oct-12	ACSA FACT	Stuart	Ratcliffe	Metron Aviation
12-Oct-12	ACSA FACT	Sheila	Thomas	Landrum & Brown

Appendix D Aircraft Codes

Table 11 lists the aircraft codes mentioned in this report.[10]

Table 11: Aircraft Codes

Code	Aeroplane Wing Span	Outer Main Gear Wheel Span
A	< 15m (49.2')	<4.5m (14.8')
B	15m (49.2') – <24m (78.7')	4.5m (14.8') – <6m (19.7')
C	24m (78.7') – <36m (118.1')	6m (19.7') – <9m (29.5')
D	36m (118.1') – <52m (170.6')	9m (29.5') – <14m (45.9')
E	52m (170.6') – <65m (213.3')	9m (29.5') – <14m (45.9')
F	65m (213.3') – <80m (262.5')	14m (45.9') – <16m (52.5')

[10] Cooperative Development of Operational Safety and Continuing Airworthiness, Aerodrome Standards; Aerodrome Design and Operations. Table 1-1: Aerodrome reference code.