# Table of Contents

<table>
<thead>
<tr>
<th>HEADING / CHAPTER</th>
<th>PAGE NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introduction</td>
<td>5</td>
</tr>
<tr>
<td>2. Scope</td>
<td>5</td>
</tr>
<tr>
<td>3. Purpose</td>
<td>5</td>
</tr>
<tr>
<td>4. Records of amendments</td>
<td>6</td>
</tr>
<tr>
<td>5. List of effective pages</td>
<td>7</td>
</tr>
<tr>
<td>6. List of abbreviations &amp; definitions used in this documents</td>
<td>8</td>
</tr>
<tr>
<td>6.1. Definitions</td>
<td>8</td>
</tr>
<tr>
<td>6.2. Abbreviations</td>
<td>8</td>
</tr>
<tr>
<td>7. Reference document(s)</td>
<td>9</td>
</tr>
<tr>
<td><strong>Part I General</strong></td>
<td></td>
</tr>
<tr>
<td>8. Induction</td>
<td>10</td>
</tr>
<tr>
<td>9. Dress Code</td>
<td>10</td>
</tr>
<tr>
<td>10. Office Administration Activities</td>
<td>10</td>
</tr>
<tr>
<td><strong>Part II Flight Procedure Validation</strong></td>
<td></td>
</tr>
<tr>
<td>11. Validation Objectives</td>
<td>12</td>
</tr>
<tr>
<td>11.1. Ground Validation</td>
<td>12</td>
</tr>
<tr>
<td>11.2. Flight Validation</td>
<td>12</td>
</tr>
<tr>
<td>12. The procedure design process</td>
<td>12</td>
</tr>
<tr>
<td>13. SACAA Procedure design standards</td>
<td>12</td>
</tr>
<tr>
<td>14. SACAA VALIDATION PROCESS</td>
<td>13</td>
</tr>
<tr>
<td>14.1. Ground validation</td>
<td>13</td>
</tr>
<tr>
<td>14.2. Flight Validation</td>
<td>13</td>
</tr>
<tr>
<td>14.2.1. Pre-Flight Validation</td>
<td>14</td>
</tr>
<tr>
<td>14.2.2. Flight simulation</td>
<td>14</td>
</tr>
<tr>
<td>14.2.3. Flight Validation</td>
<td>14</td>
</tr>
<tr>
<td>14.2.3.1. Data Verification</td>
<td>15</td>
</tr>
<tr>
<td>14.2.3.2. Assess Obstacles</td>
<td>15</td>
</tr>
<tr>
<td>14.2.3.3. Assess Flyability and Human Factors</td>
<td>15</td>
</tr>
<tr>
<td>14.2.3.4. Associated validation tasks</td>
<td>15</td>
</tr>
<tr>
<td>14.2.3.5. Chart depiction and details</td>
<td>16</td>
</tr>
<tr>
<td>14.2.4. Post-Flight Analysis and Documentation</td>
<td>16</td>
</tr>
<tr>
<td><strong>Part III Flight Procedure Design Standards</strong></td>
<td></td>
</tr>
<tr>
<td>15. Flight Procedure Design</td>
<td>17</td>
</tr>
<tr>
<td>15.1. Flight Procedure Design Standards</td>
<td>17</td>
</tr>
<tr>
<td>Section</td>
<td>Title</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>15.2</td>
<td>PBN Flight Procedures</td>
</tr>
<tr>
<td>15.3</td>
<td>APV Procedures</td>
</tr>
<tr>
<td>15.4</td>
<td>Environmental Requirements</td>
</tr>
<tr>
<td>16.</td>
<td>Design Standards</td>
</tr>
<tr>
<td>16.1</td>
<td>Conversion Factors</td>
</tr>
<tr>
<td></td>
<td>Table 16.1.1: Conversion Factors</td>
</tr>
<tr>
<td>16.2</td>
<td>Rounding</td>
</tr>
<tr>
<td>16.3</td>
<td>Definition of a Segment</td>
</tr>
<tr>
<td>16.4</td>
<td>Procedure Restrictions</td>
</tr>
<tr>
<td>16.5</td>
<td>Speed Restrictions</td>
</tr>
<tr>
<td>16.6</td>
<td>SID/STAR Naming Protocol</td>
</tr>
<tr>
<td>16.7</td>
<td>STAR Termination Points/Radar Vectoring Points</td>
</tr>
<tr>
<td>16.8</td>
<td>Minimum Altitude for the Design of Holding and Racetrack Patterns</td>
</tr>
<tr>
<td>16.9</td>
<td>Calculation of DME Slant Range</td>
</tr>
<tr>
<td>16.10</td>
<td>Sector Entries</td>
</tr>
<tr>
<td>16.11</td>
<td>Horizontal and Vertical Tolerances</td>
</tr>
<tr>
<td></td>
<td>Table 16.11.1: Minimum Horizontal &amp; Vertical Tolerances</td>
</tr>
<tr>
<td>16.12</td>
<td>Minimum Obstacle Clearance</td>
</tr>
<tr>
<td></td>
<td>Table 16.12.1: Minimum Obstacle Clearance</td>
</tr>
<tr>
<td>16.13</td>
<td>Obstacle Clearance Altitude/Height (OCA/H)</td>
</tr>
<tr>
<td>16.14</td>
<td>Visual Manoeuvring (Circling) Requirements</td>
</tr>
<tr>
<td>16.15</td>
<td>Waypoint Naming Protocol for PBN Flight Procedures</td>
</tr>
<tr>
<td>16.16</td>
<td>RNAV Waypoint Naming Protocol for RNAV Instrument Approach Procedures (IAP)</td>
</tr>
<tr>
<td></td>
<td>Table 16.16.1: Waypoint Naming Protocol for RNAV Instrument Approach Procedures</td>
</tr>
<tr>
<td>16.19</td>
<td>RADAR Minimum Altitude (RADAR Terrain Clearance) Chart</td>
</tr>
<tr>
<td>16.20</td>
<td>Procedure Containment</td>
</tr>
<tr>
<td>16.21</td>
<td>Use of Various Navigation Systems</td>
</tr>
<tr>
<td>17.</td>
<td>Design Verification</td>
</tr>
<tr>
<td>18.</td>
<td>DesignMaintenance</td>
</tr>
<tr>
<td>19.</td>
<td>Design Approval</td>
</tr>
<tr>
<td>20.</td>
<td>Annex 14 Obstacle Limitation Surface Assessments</td>
</tr>
<tr>
<td></td>
<td>Part IV Aeronautical Charting Standards</td>
</tr>
</tbody>
</table>
## 21. Colour Palette
- 21.1. Build-up Areas
- 21.2. Hydrography
- 21.3. Topography
- 21.4. Restricted, Prohibited and Danger Areas
- 21.5. Air Traffic Services Airspace
- 21.6. 10 NM Distance Circle
- 21.7. Spot Heights
- 21.8. Navigation Aid Information Block
- 21.9. Latitude & Longitude
- 21.10. Reporting Point; Holding and Information Block
- 21.11. Obstacles

## 22. Chart Examples
- 22.1. Aerodrome Chart
- 22.2. Ground Movement Chart
- 22.3. Aerodrome Hot Spot Chart
- 22.4. Standard Terminal Arrival Chart
- 22.5. Standard Instrument Departure Chart
- 22.6. Instrument Approach Chart
- 22.7. RNAV (GNSS) Chart
- 22.8. RNAV (GNSS) Tabular Chart - Departure
- 22.9. RNAV (GNSS) Tabular Chart - Arrival
- 22.10. Radar Terrain Clearance Chart
- 22.11. Aerodrome Obstacle Chart Type A
- 22.12. Precision Approach Terrain Chart

## 23. Chart Verification

## 24. Chart Maintenance

## 25. Chart Approval

## Part V Miscellaneous
- 26. Document Control and Authorisation
- 27. Continuous Improvement
- 28. Records
- 29. Document Authorisation and Control
- 30. ANNEX – A Procedure Design Flowchart
  - ANNEX - B IDEF0 Process
  - ANNEX – C Procedure Design Package (PDP)
  - ANNEX – D Procedure Design Process
  - ANNEX – E Flight simulation

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**Version:** Re-Issue

**Effective Date:** 28 FEBRUARY 2013

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**Issue Number:** 3

**Document Classification:** Restricted

Page 4 of 61
1. INTRODUCTION
This MOP is one of the sets of manuals forming the Civil Aviation Authority’s internal documentation set. It is a directive upon all personnel charged with the responsibility for conducting the Instrument Flight Procedure Validation.

Notes:
Compliance with this manual, however, is not a substitute for common sense and sound judgment.
This MOP will only be used by Procedure Design & Cartography personnel designated by the Director of Civil Aviation as Authorised Officers in terms of Section 88(1)(a) of the Civil Aviation Act of 2009 (Act No. 13 of 2009)

2. SCOPE
This document is aimed at providing guidance to Procedure Design & Cartography personnel appointed in carrying out Procedure Design Validation functions within SACAA. Validation in this context incorporates Ground and Flight Validation of which all or some of the functions may be delegated to 3rd parties but ultimate responsibility of this function shall always remain with SACAA.

3. PURPOSE
The purpose of this MOP is to provide guidance to Procedure Design & Cartography personnel in the performance of their duties. It is written to ensure that standards are applied that promote the safe conduct of civil aviation and to enhance the values of the SA CAA.
4. RECORD OF AMENDMENTS

(All amendments to this Manual must be made in accordance with GP002 which contains the Manual Amendment Procedure see GP002c)

<table>
<thead>
<tr>
<th>Amendment Number</th>
<th>Pages Affected</th>
<th>Date Amended</th>
<th>Approved By: Name</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Version: Re-Issue
Effective Date: 28 FEBRUARY 2013
Latest revision: 8 July 2011
Issue Number: 3
Document Classification: Restricted
5. LIST OF EFFECTIVE PAGES

<table>
<thead>
<tr>
<th>Revision No.: Original</th>
<th>Column 1</th>
<th>Column 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>* PAGE</td>
<td>REVISION</td>
<td>DATED</td>
</tr>
</tbody>
</table>

* Indicates page revised, added or deleted by this revision. Column 2 should be completed only when column 1 is full.
# 6 LIST OF ABBREVIATIONS AND DEFINITIONS USED IN THIS DOCUMENT

## 1.1 Terminology

<table>
<thead>
<tr>
<th>TERMINOLOGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARINC 424</td>
<td>Navigation System Database standard which is an international standard file format for aircraft navigation data.</td>
</tr>
</tbody>
</table>

## 1.2 Abbreviations

<table>
<thead>
<tr>
<th>ABBREVIATION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARINC</td>
<td>Aeronautical Research Incorporated</td>
</tr>
<tr>
<td>ATC</td>
<td>Air Traffic Control</td>
</tr>
<tr>
<td>ATS</td>
<td>Air Traffic Services</td>
</tr>
<tr>
<td>COB</td>
<td>Close of Business</td>
</tr>
<tr>
<td>CRC</td>
<td>Cyclic Redundancy Check</td>
</tr>
<tr>
<td>FMS</td>
<td>Flight Management System</td>
</tr>
<tr>
<td>GNSS</td>
<td>Global Navigation Satellite System</td>
</tr>
<tr>
<td>GPWS</td>
<td>Ground Proximity Warning System</td>
</tr>
<tr>
<td>ICAO</td>
<td>International Civil Aviation Authority</td>
</tr>
<tr>
<td>IDEF0</td>
<td>Integration Definition language 0</td>
</tr>
<tr>
<td>IFP</td>
<td>Instrument Flight Procedure</td>
</tr>
<tr>
<td>IFR</td>
<td>Instrument Flight Rules</td>
</tr>
<tr>
<td>MOPS</td>
<td>Manual of Operating Procedures and Standards</td>
</tr>
<tr>
<td>NAVAIDS</td>
<td>Navigational Aids</td>
</tr>
<tr>
<td>OJT</td>
<td>On the Job Training</td>
</tr>
<tr>
<td>PANS-OPS</td>
<td>Procedures for Air Navigation – Operations</td>
</tr>
<tr>
<td>PBN</td>
<td>Performance Based Navigation</td>
</tr>
<tr>
<td>PD&amp;C</td>
<td>Procedure Design &amp; Cartography Section of the South African Civil Aviation Authority</td>
</tr>
<tr>
<td>PDP</td>
<td>Procedure Design Package</td>
</tr>
<tr>
<td>PMS</td>
<td>Performance Monitoring System</td>
</tr>
<tr>
<td>RADAR</td>
<td>Radar</td>
</tr>
<tr>
<td>RNAV</td>
<td>Area Navigation</td>
</tr>
<tr>
<td>RNP AR</td>
<td>Required Navigation Performance – Authorisation Required</td>
</tr>
<tr>
<td>RWY</td>
<td>Runway</td>
</tr>
<tr>
<td>SACAA</td>
<td>South African Civil Aviation Authority</td>
</tr>
<tr>
<td>SOP</td>
<td>Standard Operating Procedure</td>
</tr>
<tr>
<td>SP</td>
<td>Service Provider</td>
</tr>
<tr>
<td>VGSI</td>
<td>Visual Glide Slope Indicator</td>
</tr>
</tbody>
</table>
## 7 REFERENCE DOCUMENTS

The following references would have to be accessed for the proper execution of the procedures and tasks in this Manual of Procedures and Standards:

<table>
<thead>
<tr>
<th>a.</th>
<th>ICAO Annexes: 1, 2, 4, 6, 10, 11, 14, 15 and 16 as amended.</th>
</tr>
</thead>
<tbody>
<tr>
<td>b.</td>
<td>ICAO Docs: 4444, 7474, 8168, 8400, 9377, 9426, 9501, 9554, 9613, 9674, 9689, 9734, 9735, 9750, 9849, 9854, 9868, 9869, 9870, 9881, 9882, 9883, 9905, 9906, 9992 and 9997 as amended.</td>
</tr>
<tr>
<td>c.</td>
<td>ICAO Circulars: 120, 205, 249, 257, 278, 301, 303, 305, 317, 319, 321, 324 and 330 as amended.</td>
</tr>
<tr>
<td>d.</td>
<td>SA CAR and CATS Part 173 and 187 as amended.</td>
</tr>
</tbody>
</table>
## PART I GENERAL

### 8 INDUCTION

All PD&C staff shall undergo the following induction courses as soon as practicable upon joining the SACAA:

- **HR** – introduction
- **ISO** – Presented by QA

### 9 DRESS

It is expected that personnel comply with the CAA’s dress code which is semi formal/ business casual. Note: Certain casual wear is approved for Fridays.

### 10 OFFICE ADMINISTRATION ACTIVITIES

All PD&C staff are required to perform the following duties as part of their Office Administration Activities:

- Bi-annually review and be cogniscent of the content of the following Personnel documents:
  - Job Description
  - Delegation of Authority
  - PMS Agreement

- Review and be cogniscent of all the PD&C Office Procedures and Policy wrt:
  - Approval of Leave
  - Overtime Policy
  - Working Hours

- Apply all PD&C Administrative Procedures including:
  - Forms
  - Travel authorisation – domestic & international
  - Travel Claims and Advances
  - Overtime Spreadsheet
  - Training requisition

- Annually review and apply the content of the following documents:
  - Aviation Regulations (CARs & CATs)
  - Relevent ICAO Documents & Annexes
  - PD&C MOPS
  - PD&C Audit and surveillance Plan
  - IAIP
• Apply all the following Training requirements:
  o Review Training Policy (see HR manual)
  o Annually in January, review and update their own CA 183-61 Skills Profile Form
  o Update and maintain their Training File including obtaining all the necessary signatures and filing of OJT reports
• Monthly complete their Monthly Activity Report by the COB on the 28th day of each month. Staff on leave or attending courses over this period must submit their report before leaving for such leave or courses.
• All personnel are required to adhere to all SACAA and PD&C Records Management Policies at all times.
• All staff are expected to comply with the following requirements wrt Mentoring and coaching:
  o Form CA 183-68 (Training Plan for On-The-Job Training) shall be completed for all OJT conducted.
  o Direct supervision of validation, inspection & audit activities must be provided by qualified Inspectors.
  o Coaching on noncompliance issues must be given to all personnel undergoing training.
  o A minimum of two validations/ inspections/ audits must be satisfactorily completed without direct supervision before going solo.
• All PD&C staff must comply with the following requirements wrt Meeting participation:
  o Participation in meetings must be considered carefully & well prepared for. As a representative of the CAA a participant is expected to be professional in approach & must be knowledgeable in relevant subject matter.
  o Where a participant must represent the SACAA's position on specific issues a proper mandate must be obtained from the relevant SACAA office beforehand. If unsure on an issue do not commit the SACAA without proper authority.
  o Appropriate feedback must be given to the SACAA after participation, including written reports in respect of international meetings, copies of minutes, verbal reports, proposed further actions, briefing to colleagues, etc.
PART II FLIGHT PROCEDURE VALIDATION

11 VALIDATION OBJECTIVES

Validation, according to ICAO PANS-OPS DOC 8168 VOL II states “Validation is the necessary final quality assurance step in the procedure design process, prior to publication. The purpose of validation is the verification of all obstacle and navigation data, and assessment of flyability of the procedure. Validation normally consists of ground validation and flight validation. Ground validation shall always be undertaken. When the State can verify, by ground validation, the accuracy and completeness of all obstacle and navigation data considered in the procedure design, and any other factors normally considered in the flight validation, then the flight validation requirement may be dispensed with”

This Part of the MOPS describes how Ground and Flight Validation will be conducted within South Africa and within SACAA. The validation function(s) may be delegated to 3rd parties but SACAA shall remain responsible for all PANS-OPS related validation activities within South Africa.

11.1 Ground Validation

The purpose of ground validation is a review of the entire instrument flight procedure package by person(s) trained in procedure design and with appropriate knowledge of flight validation issues. It is meant to catch errors in criteria and documentation, and evaluate on the ground, to the extent possible, those elements that will be evaluated in a flight validation. Issues identified in the ground validation should be addressed prior to any flight validation. The ground validation will also determine if flight validation is needed for modifications and amendments to previously published procedures.

11.2 Flight Validation

Flight validation should not be confused with flight inspection. Flight inspection of instrument flight procedures is required to assure that the appropriate navigation system adequately supports the procedure whereas the purpose of conducting Flight Validation of instrument flight procedures is to ensure safety, procedure data integrity and flyability.

The SACAA Flight Validation process shall follow the basic requirements as set out in ICAO DOC 9906 Volume 5 and Volume 6 for associated Flight Validation crew training and evaluation but it may change or amend the requirements to suite National guidelines and practices.

12 THE PROCEDURE DESIGN PROCESS

In order to understand where the validation activities reside within the total Procedure Design process in South Africa, the total Procedure Design process is illustrated in Annex – A. The SACAA validation activity is shown on page 2 of the Procedure Design Process diagram.

13 SACAA PROCEDURE DESIGN STANDARDS

Due to specific requirements and National operating procedures, SACAA Procedure Design standards are published to supplement and/or replace ICAO standards and recommended practices. These standards are published in Part III of this MOPS.

14 SACAA VALIDATION PROCESS

The SACAA Validation process is described in terms of the Integration DEFinition language 0 (IDEFO) which is the
common name referring to classes of enterprise modeling languages. Annex – B provides an explanation of IDEF0 and how it is used. Annex – D illustrates the SACAA validation process in IDEF0 language together with a description of each data and information element associated with each activity but for ease of use, the following paragraphs describe the entire process in laymen’s terms.

### 14.1 Ground validation

The Ground Validation activity will commence with the receipt of a “Procedure Design Package (PDP)” The structure and content of the PDP is described in Annex – C (This Annex will be published and made available to all SP’s). Approved procedure design Service Providers shall ensure that the PDP is complete and will submit the PDP upon application of procedure design approvals. The first task of the Validation process is the checking of the PDP by SACAA staff to ensure that it is complete. Incomplete PDP’s shall be returned to the applicant showing elements of the PDP that are incomplete.

Following a complete PDP, checks will be carried out on the procedures which will include but are not limited to:

1. Check if the design is based on a declared obstacle, aerodrome and Navaid data set.
2. The design is based on a declared ICAO PANS-OPS DOC 8168 Vol II version.
3. That obstacle data accuracy is declared and where appropriate, conform to ICAO Annex-15 data accuracy and integrity requirements.
4. Ensure that all procedure tracks have appropriate associated protection areas.
5. Where appropriate, procedures are accompanied by communication failure procedures.
6. Calculations can be tracked and verified.
7. Where designs do not conform to ICAO DOC 8168 criteria that these have been agreed with SACAA or is accompanied by a Safety Case.
9. Provide evidence that stakeholders have been consulted with.
10. Check if the procedure is flyable.
11. Check that the procedure is safe.
12. For all PBN procedures, check the correctness of Path Terminators used.
13. Review pertinent flight inspection reports.
14. Check if the applicable navigation systems support the intended instrument procedure. Check NAVAIDS, GNSS availability and assess if flight inspection is required.
15. Determine if Flight Validation is required.

More detail is provided in DOC 9906 Vol 5 to guide the ground validation process.

### 14.2 Flight Validation

Following the obstacle and navigation checking function, a decision will need to be made as to whether Flight Validation will be required. It might be that only Flight simulation is required but this decision is based on various factors. ICAO gives some guidance as to when a Flight Validation is required and they are:

a. New procedures where there are no published procedures to the same RWY.
b. Procedures that contain non-standard design elements (deviation from criteria e.g. non-standard approach angles/steepe approach, non-standard segment lengths, speeds, bank angles etc.)
c. When accuracy/integrity of data used in the IFP design and/or the Aerodrome environment is not assured.
This list is not all inclusive but provides some guidance as to when Flight Validation will be required.

Annex - E provides some guidance as to when Flight Simulation, Flight Validation and Night Flight Validation is required.

### 14.2.1 Pre-Flight Validation

The first step of Flight validation is to conduct a pre-flight validation. A pre-flight validation review of the entire instrument flight procedure package shall be completed by a person(s) familiar with procedure design concepts and with appropriate knowledge of flight validation issues. It is meant to identify deviations from criteria and documentation and evaluate prior to flight, to the extent possible, those elements that will be evaluated in the flight validation phase. Issues identified during the pre-flight validation phase should be addressed prior to the flight validation phase. Pre-flight validation determines the necessary subsequent steps in the flight validation process. Before proceeding to the next step, any discrepancies should be resolved with the designer.

The pre-flight review process shall include:

- Conduct Inventory and Review IFP Package.
- Evaluate data and coding (for RNAV procedures)
- Review special operational and training requirements.
- Coordinate operational issues.
- Document the results of the pre-flight validation phase

An explanation of what is required for each of the pre-flight review elements are contained in ICAO DOC 9906 Volume 5.

### 14.2.2 Flight Simulation

Following the pre-flight review process, a decision will need to made, to ascertain if Flight Simulation is required. Flight Simulation is normally required for complex or special procedures where simulator evaluation is desired for instance RNP AR procedures or procedures with demanding operational requirements. The evaluation should be flown in a capable simulator which matches the procedure requirements. For RNP AR type procedures where procedures are designed for a specific make/ model/ series and specific FMS and software, the simulator evaluation should be flown in a simulator with the same configuration used by the operator in daily operations. For all other Flight Simulation requirements, the simulator used shall reflect the most demanding aircraft type(s) that would normally operate to and from the designated airport.

Simulator results shall be documented and aircraft tracking software is recommended as proof to support the Flight Simulation outcome.

### 14.2.3 Flight Validation

The objectives of the Flight Validation of instrument procedures are to:

- Conduct an assessment of flyability to determine that the procedure can be safely flown.
- Provide the final assurance that adequate obstacle clearance has been provided.
- Verify that the navigation data to be published is correct.
- Verify that all required infrastructure, such as runway markings, lighting, and communications and navigation sources are in place and operative.
- Ensure the documentation of navigation systems confirms the applicable navigation system(s) (NAVAID, GNSS, RADAR, etc.) supports the procedure.
f. Evaluate other operation factors, such as charting, required infrastructure, visibility, intended aircraft category, etc.

g. Verify that waivers to standard design do not compromise safety.

14.2.3.1 Data Verification

It is essential that the data used in the procedure design compares to the charts, flight management system (FMS) data, or suitable navigation system data. The validation flights (simulator or aircraft) should be recorded with a collection/recording device that archives the procedure and aircraft positioning data. The procedure development package, charts, and airport data must match. It is recommended that RNAV/RNP procedures are packed and loaded electronically into the FMS or suitable navigation system without manually coding the ARINC 424 path/terminator data. Integrity measures such as Cyclic Redundancy Check (CRC) should be used to assure that data are not corrupted. This allows the flight validation process to evaluate the data as it was developed, without manipulation. If the procedure waypoint data must be manually entered into the FMS, it must be compared to the procedure data to ensure the data points match.

14.2.3.2 Assess Obstacles

Controlling obstacles in each segment must be confirmed during flight but if the Validation crew are unable to confirm the declared controlling obstacle of the respective segment, then the Validation crew should list the approximate location, type, and approximate elevation of the obstacle(s) that have been identified as controlling obstacles for the designer to consider. The Flight Validation Pilot will place special emphasis on newly discovered obstacles if found higher than the declared obstacle list.

More detailed information is described in ICAO DOC 9906 Vol 5.

14.2.3.3 Assess Flyability and Human Factors

The objectives of flyability assessment of instrument flight procedures are:

a. Evaluate aircraft manoeuvring areas for safe operations for each category of aircraft for which the procedure is intended.

b. Review the flyability of the instrument procedure as per ICAO DOC 9906 Vol 5.

The flyability assessment must be flown at speeds and aircraft configurations consistent with the normal instrument flight rules (IFR) operations and meet the design intent (Aircraft Category). The Final Approach Fix to Threshold of an instrument approach procedure must be flown in the landing configuration, on profile, on speed with the Ground Proximity Warning System (GPWS) active. Flyability should be evaluated with the aircraft coupled to the autopilot (to the extent allowed by the aircraft flight manual or SOP(s)) and may require additional evaluation by hand flying. Aircraft category restrictions might be published and must be confirmed acceptable. For instance, where a speed restriction is imposed, the validation pilot shall confirm that the speed restriction is acceptable for all types of aircraft for which the procedure was designed. In every case, the pilot is required to pay particular attention to the general safe conduct of the procedure and efficiency of the flight for the intended aircraft category.

14.2.3.4 Associated validation tasks

The following associated flight validation tasks may be performed in conjunction with the obstacle or flyability assessment as required:

a. Verify that all required runway markings, lighting, and communications are in place and operative.

b. Verify that any required NAVAID(s) have been satisfactorily flight inspected to support the procedure design.

c. Ensure the Visual Glide Slope Indicator (VGSI) angles appear as intended or charted when evaluating
vertically guided procedures.

d. Air to ground and ground to air communications with ATC must be satisfactory at the initial approach fix or intermediate fix minimum altitude and at the holding fix. Satisfactory communications coverage over the entire Minimum Vectoring Altitude, airway or route segment (in controlled airspace) at the minimum en route IFR altitude must be available with an ATS facility.

e. Ensure radar coverage is available for all portions of the procedure, where applicable.

f. Indicate any GPWS warnings or alerts. Record details of the alert to include lat/long, aircraft configuration, speed, and altitude.

g. If night evaluation is required, determine the adequacy of airport lighting systems prior to authorizing night operation. Conduct night evaluations during VMC following appropriate daytime evaluation.

h. Evaluate the light system for:

i. Correct light pattern as charted.

j. Local lighting pattern in the area surrounding the airport to ensure they do not distract, confuse, or incorrectly identify the runway environment.

k. Verify that waivers to standard design do not compromise safety.

### 14.2.3.5 Chart depiction and details

The Validation pilot shall check if the charted information is correct. Any discrepancies identified on the chart(s) shall be reported.

### 14.2.4 Post-Flight Analysis and Documentation

The Flight validation process shall be adequately documented and the results stored as appropriate. ICAO DOC 9906 Volume 5, Appendix – C gives guidance on what type of information is to be documented and stored but shall contain at least the following:

a. A detailed written report of the results of the flight validation.

b. Operational mitigations are documented.

c. Controlling obstacle(s) position and elevation data if different to those as designed.

d. Recorded data is processed and made available for archiving.
PART III FLIGHT PROCEDURE DESIGN STANDARDS

15 FLIGHT PROCEDURE DESIGN

15.1 Flight Procedure Design Standards

Flight Procedures shall be designed, verified, validated, published, reviewed and archived in accordance with ICAO Doc 8168 Vol II (as amended) and ICAO Doc 9906 (as amended) unless this MOPS specifies a more conservative standard.

15.2 PBN Flight Procedures

The implementation of PBN, in accordance with ICAO Doc 9613 and the South African PBN Road Map, is encouraged. Existing RNAV procedures based on pre-PBN criteria should be revised as part of the procedure’s maintenance and review to comply with PBN criteria.

15.3 APV Procedures

The implementation of Approach Procedures with Vertical Guidance (APV) is highly recommended to support PBN Implementation in South Africa and to assist in achieving the ICAO target dates.

15.4 Environmental Requirements

Flight procedures should be designed to take cognisance of environmental & noise sensitive areas and to reduce or limit the environmental and noise impact to minimum without compromising safety.

16 DESIGN STANDARDS

16.1 Conversion Factors

Primary units to be used for all calculations with only the answer converted to the secondary units. The following conversion factors shall be used:

Table 16.1.1: Conversion Factors

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feet (FT)</td>
<td>Metre (M)</td>
<td>x 0.3048</td>
</tr>
<tr>
<td>Feet (FT)</td>
<td>Nautical Mile (nm)</td>
<td>+ 6076</td>
</tr>
<tr>
<td>Metre (M)</td>
<td>Feet (FT)</td>
<td>+ 0.3048</td>
</tr>
<tr>
<td>Metre (M)</td>
<td>Nautical Mile (nm)</td>
<td>+ 1852</td>
</tr>
<tr>
<td>Nautical Mile (nm)</td>
<td>Feet (FT)</td>
<td>x 6076</td>
</tr>
<tr>
<td>Nautical Mile (nm)</td>
<td>Metre (M)</td>
<td>x 1852</td>
</tr>
</tbody>
</table>

16.2 Rounding

The maximum available resolution shall be used for all calculations. Rounding shall only be performed in the final result of the calculation. All values published in the design report/documentation shall be rounded to 4 decimal places where possible.
### 16.3 Definition of a Segment

A segment commences at the nominal fix at the beginning of the segment and end at the nominal fix at the end of the segment (Fix-to-Fix).

For Obstacle Assessments purposes the segment commences at the Early Along Track Tolerance (eATT) of the nominal fix at the start of the segment and ends at the nominal fix at the end of the segment.

Turn Areas shall be assessed as part of the segment in which it occurs.

### 16.4 Procedure Restrictions

Where aircraft performance/operational restrictions have to be applied, restrictions should be limited to 1 restriction with the least possible impact per procedure.

A safety case/aeronautical study shall be submitted with the procedure where more than 1 restriction is specified per procedure or where design criteria outside the ICAO parameters are used. (Refer Annex C above)

### 16.5 Speed Restrictions

Speed Restrictions should be limited to not less than 220kts for CAT C & D, where possible, in order to ensure that the efficiency of large aircraft can be maintained.

### 16.6 SID/STAR Naming Protocol

SIDs will be named in accordance with ICAO Annex 11 Appendix 3 (Principles Governing the Identification of Standard Departure and Arrival Routes and Associated Procedures).

STARs will be named in accordance with ICAO Annex 11 Appendix 3 (Principles Governing the Identification of Standard Departure and Arrival Routes and Associated Procedures).

### 16.7 STAR Termination Points/Radar Vectoring Points

All Standard Instrument Arrivals (STAR) shall be designed from the starting point of the STAR to a common Intermediate Fix (IF) for all Instrument Approach Procedures (using the S- or U-profiles) or the Initial Approach Fix (IAF) when joining a RNAV Approach unless operational requirements preclude the use of a common IF. This is to ensure that the Communication Failure Procedure complies with PANS-OPS criteria and to enable transition from one procedure to another.

Common pronounceable 5LNC waypoints can be defined from where the aircraft can be radar vectored onto the IF or RNAV IAF (FM or VM Path Terminator).

### 16.8 Minimum Altitude for the Design of Holding and Racetrack Patterns

It is recommended that the Minimum Altitude to be used for the construction of a Holding Pattern is the highest MSA value rounded up to the nearest 500ft or 1000ft.

### 16.9 Calculation of DME Slant Range

It is recommended that the Slant Range for the highest and lowest Holding Level be calculated to determine if there is a significant difference between these two values.

It is recommended to use/publish the DME Slant Range for the highest altitude as this DME value will move the fix location away from the facility at lower altitudes. This difference (depending on the distance from the DME facility) might be offset by the fact that the holding protection area at the highest altitude will overlap the holding protection area of the lowest holding altitude due to the higher TAS used for the construction of the hold protection area at this higher altitude.

Fixes shall be designed to coincide with full DME distances, unless circumstances necessitate decimal distances.
Motivation for non-compliance shall be stated in the design report.

16.10 Sector Entries

Sector Entries in Holding Patterns or Racetrack procedures shall be designed to accommodate entry from all 3 sectors to enable omni-directional entries for use by other procedures, unless an operational restriction is created. Where restrictions on sectors are implemented, such restrictions shall be indicated on the chart with the necessary annotation and/or specified in the text.

16.11 Horizontal and Vertical Tolerances

The following Minimum Horizontal and Vertical Tolerances shall be applied unless the accuracy of the data can be proven otherwise:

<table>
<thead>
<tr>
<th>Table 16.11.1: Minimum Horizontal &amp; Vertical Tolerances</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Source</strong></td>
</tr>
<tr>
<td>Survey Data (with WGS84 Ingerity Report)</td>
</tr>
<tr>
<td>Survey Data (without WGS84 Ingerity Report)</td>
</tr>
<tr>
<td>SRTM Terrain Data</td>
</tr>
<tr>
<td>Google Earth Data</td>
</tr>
<tr>
<td>SACAA Legacy Data</td>
</tr>
<tr>
<td>CD:NGI Terrain Data</td>
</tr>
<tr>
<td>Map Digitized Data</td>
</tr>
</tbody>
</table>

Map digitized data shall not be used unless no other data source is available. Where map digitized data is used, additional restrictions may be applied.

16.12 Minimum Obstacle Clearance

The following Minimum Obstacle Clearance (MOC) shall be applied:

<table>
<thead>
<tr>
<th>Table 16.12.1: Minimum Obstacle Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Segment</strong></td>
</tr>
<tr>
<td>Radar Minimum Altitude Chart (RMAC)</td>
</tr>
<tr>
<td>MSA (Conventional)</td>
</tr>
<tr>
<td>TAA/MSA (RNAV)</td>
</tr>
</tbody>
</table>
16.13 Obstacle Clearance Altitude/Height (OCA/H)

The OCA/H for the procedure shall be calculated and specified in the Procedure Design Report. Where a Missed Approach Climb Gradient greater than 2.5% is required, the Missed Approach Climb Gradient shall be specified as well as the OCA/H for a 2.5% Missed Approach Climb Gradient.

For publication purposes, the OCA/H shall be published as the higher value of:

a. The calculated OCA/H as contained in the Procedure Design Report, or
b. System Minima, or
c. State Minima, whichever is higher.

For RNAV Procedures, the OCA/H shall be published in the Minima Block for the applicable type of procedure:

<table>
<thead>
<tr>
<th>Type</th>
<th>Minima Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>2D RNAV</td>
<td>LNAV</td>
</tr>
<tr>
<td>APV (BaroVNAV)</td>
<td>LNAV/VNAV</td>
</tr>
<tr>
<td>APV (SBAS):</td>
<td>LPV</td>
</tr>
<tr>
<td>GBAS:</td>
<td>GLS</td>
</tr>
</tbody>
</table>

16.14 Visual Manoeuvring (Circling) Requirements

In South Africa Visual Manoeuvring (Circling) procedures are known as “Cloudbreak”/“Breakcloud” procedures.

**ICAO Definition**: “Visual Manoeuvring (Circling) is the term used to describe the visual phase of flight after completing an instrument approach, which brings an aircraft into position for landing on a runway which is not suitably located for straight-in approach, i.e. one where the criteria for alignment or descent gradient cannot be met”.

Visual Manoeuvring (Circling) procedures shall be designed in accordance with the standards contained in ICAO Doc 8168 Vol II.

Visual Manoeuvring (Circling) procedures may be approved by the Commissioner for Civil Aviation, when one or more of the following conditions apply:

a. Where the Final Approach Track alignment (straight-in alignment) criteria, as contained in ICAO Doc 8168 Vol II, cannot be met.

b. Where the straight-in descent gradient criteria, as contained in ICAO Doc 8168 Vol II, cannot be met.

c. Such procedure is conducted inside controlled airspace.

d. Such procedure is conducted outside controlled airspace.

e. Real-time local QNH may not be available.

f. The runway and/or equipment do not comply with the ICAO requirements.

In the event that such runway and/or equipment does not comply with ICAO requirements, the OCA/H will not be lower than that specified for a Visual Manoeuvring (Circling) procedure applicable to the specific aircraft category.

Any procedure conducted outside controlled airspace is conducted entirely at the discretion of the pilot-in-command.
When a Visual Manoeuvring (Circling) OCA/H is not specified, any “Circle to Land” procedure is conducted entirely at the discretion of the Pilot-in-command, unless Visual Manoeuvring (Circling) is totally prohibited.

The Visual Manoeuvring (Circling) OCA is calculated and published relative to Mean Sea Level but the OCH is calculated and published relative to the Reference Elevation as published on the applicable chart.

**16.15 Waypoint Naming Protocol for PBN Flight Procedures**

With the Implementation of RNAV flight procedures, there is a requirement for suitable instrument approach charts to be prepared and published. A standard convention of naming or identifying the waypoints of the procedures is necessary with each waypoint needing to have a unique name or identifier.

In order to conform to ARINC 424 specifications, which standardises the nature and form of aviation databases, a Five-letter Name Code (5LNC) or digit or combination of letters and digits is required to identify a particular waypoint name or identifier. The SACAA’s Procedure Design & Cartography office is responsible to assign & manage all 5LNCs for South Africa or the South African Area of Responsibility.

The following RNAV Waypoint Naming Protocol has been developed by the SACAA and is to be implemented on all RNAV procedures in South Africa.

**16.16 RNAV Waypoint Naming Protocol for RNAV Instrument Approach Procedures (IAP):**

Where a Five-letter Name Code (5LNC) has been assigned to a point, the Five-letter Name Code (5LNC) shall be used (e.g. AVAGO, NIBEX, EGMEN, etc).

Where no 5LNC has been or can be assigned, the waypoints shall be named in the following format: AABCD, where:

- **AA**
  - Last two letters of the ICAO Location Indicator for the aerodrome the procedure serves.

- **B**
  - Single digit to indicate the Designated Runway Threshold on which the procedure is based, numbered from the smallest Runway Designator and from Left to Right.

**Example:**

- FAJS RWY 03L: 1
- FAJS RWY 03R: 2
- FAJS RWY 21L: 3
- FAJS RWY 21R: 4

- **C**
  - Fix Type Identifier as listed in Table 2.16.4.2-1: Waypoint Naming Protocol for RNAV Instrument Approach Procedures below.

- **D**
  - Fix Type Number as listed in Table 2.16.4.2-1: Waypoint Naming Protocol for RNAV Instrument Approach Procedures below, except the Missed Approach Point where the letter ‘P’ shall be used as the Fix Type Number.
### Table 16.16.1: Waypoint Naming Protocol for RNAV Instrument Approach Procedures

<table>
<thead>
<tr>
<th>Fix Type</th>
<th>Fix Type Identifier</th>
<th>Fix Type Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SID Termination Waypoint, STAR Starting Waypoint, STAR Termination Waypoint, Initial Approach Fix (IAF), Holding Fix, including Missed Approach Holding Fix (MAHF) or where a 5LNC has been assigned</td>
<td>5LNC</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Initial Approach Fix (IAF) where no 5LNC has been assigned</td>
<td>N</td>
<td>'Sequential Numbering</td>
</tr>
<tr>
<td>Intermediate Approach Fix (IF)</td>
<td>T</td>
<td>Sequential Numbering</td>
</tr>
<tr>
<td>Final Approach Fix (FAF)</td>
<td>F</td>
<td>Sequential Numbering</td>
</tr>
<tr>
<td>Missed Approach Point (MAPT)</td>
<td>M</td>
<td>P</td>
</tr>
<tr>
<td>Missed Approach Fix in the Missed Approach Segment or Missed Approach Turning Fix (MATF) or Missed Approach Holding Fix (MAHF) where no 5LNC or AABCD code has been assigned</td>
<td>M</td>
<td>Sequential Numbering</td>
</tr>
<tr>
<td>SID DER/Fictitious Waypoint</td>
<td>D</td>
<td>R</td>
</tr>
</tbody>
</table>

The Fix Type Number for Initial Approach Fixes of a T- & Y-Bar RNAV Approach shall be numbered sequentially from left to right when viewed along the Intermediate/Final Approach Track Axis towards the Missed Approach Point (MAPT).

**Example:**
- OR Tambo, RWY 03L, Initial Approach Fix 1: JS1N1
- OR Tambo, RWY 03L, Initial Approach Fix 2: JS1N2
- OR Tambo, RWY 21R, FAF: JS4F1
- Waterkloof, RWY 19, MAFT: WK3MP
- Lanseria, RWY 24R, MATF 3: LA4M3

All other non-pronounceable waypoints shall be named as follows:

AA000, where:

- AA  Last two letters of the ICAO Location Indicator for the aerodrome the procedure serves.
- 000  Sequential numbering starting at 361.

**Example:**
- OR Tambo: JS001, JS002, JS003...
- Lanseria: LA001, LA002, LA003...
- Waterkloof: WK001, WK002, WK003…
Due to the fact that some RNAV database systems cannot accommodate a Step-Down Fix (SDF) within the Final Approach Segment, SDFs should be avoided where possible. Where SDFs are specified in the design, it should be depicted as a Descent Fix on the profile view of the chart.

Waypoints shall be separated by the minimum distance specified in ICAO Doc 8168 Vol II Table III-2-1-21 (Minimum Length for a RNAV Segments Limited by at Least One Waypoint which is not a Turning Waypoint) or the Minimum Stabilisation Distance (MSD), whichever is greater. Existing waypoints should be used where possible to prevent the creation of multiple waypoints in close proximity to each other. A minimum separation distance of 5NM between waypoints is recommended.

To prevent multiple names for the same waypoint, RNAV Waypoints defined for one aerodrome may be used for procedures of another aerodrome.

**Example:**
- OR Tambo SID: Route JS1F1, WK002, LA006 to NESAN
- Lanseria SID: Route LA003, WK3N1, JS004, LA007 to NESAN

### 16.17 RNAV Waypoint Naming Protocol for RNAV Standard Instrument Departures (SID):

Where a Five-letter Name Code (5LNC) has been assigned to a point, the Five-letter Name Code (5LNC) shall be used (eg. AVAGO, NIBEX, EGMEN, JS1N1, JS1T1, JS1F1, JS1M1, etc).

All other non-pronounceable waypoints shall be named as follows:

**Example:**
- AA Last two letters of the ICAO Location Indicator for the aerodrome the procedure serves.
- 000 Sequential numbering starting at 361.

**Example:**
- OR Tambo: JS001, JS002, JS003...
- Lanseria: LA001, LA002, LA003...
- Waterkloof: WK001, WK002, WK003...

Waypoints shall be separated by the minimum distance specified in ICAO Doc 8168 Vol II Table III-2-1-21 (Minimum Length for a RNAV Segments Limited by at Least One Waypoint which is not a Turning Waypoint) or the Minimum Stabilisation Distance (MSD), whichever is greater. Existing waypoints should be used where possible to prevent the creation of multiple waypoints in close proximity to each other. A minimum separation distance of 5NM between waypoints is recommended.

To prevent multiple names for the same waypoint, RNAV Waypoints defined for one aerodrome may be used for procedures of another aerodrome.

**Example:**
- OR Tambo SID: Route JS1F1, WK002, LA006 to NESAN
- Lanseria SID: Route LA003, WK3N1, JS004, LA007 to NESAN

Where a Five-letter Name Code (5LNC) has been assigned to a point, the Five-letter Name Code (5LNC) shall be used (eg. AVAGO, NIBEX, EGMEN, JS1N1, JS1T1, JS1F1, JS1M1, etc).

All other non-pronounceable waypoints shall be named as follows:

AA000, where:

- **AA**: Last two letters of the ICAO Location Indicator for the aerodrome the procedure serves.
- **000**: Sequential numbering starting at 361.

**Example:**

- OR Tambo: JS001, JS002, JS003...
- Lanseria: LA001, LA002, LA003...
- Waterkloof: WK001, WK002, WK003...

Due to the fact that some RNAV database systems cannot accommodate a Step-Down Fix (SDF) within the Final Approach Segment, SDFs should be avoided where possible. Where SDFs are specified in the design, it should be depicted as a Descent Fix on the profile view of the chart.

Waypoints shall be separated by the minimum distance specified in ICAO Doc 8168 Vol II Table III-2-1-21 (Minimum Length for a RNAV Segments Limited by at Least One Waypoint which is not a Turning Waypoint) or the Minimum Stabilisation Distance (MSD), whichever is greater. Existing waypoints should be used where possible to prevent the creation of multiple waypoints in close proximity to each other. A minimum separation distance of 5NM between waypoints is recommended.

To prevent multiple names for the same waypoint, RNAV Waypoints defined for one aerodrome may be used for procedures of another aerodrome.

**Example:**

- OR Tambo SID: Route JS1F1, WK002, LA006 to NESAN
- Lanseria SID: Route LA003, WK3N1, JS004, LA007 to NESAN

16.19 RADAR Minimum Altitude (RADAR Terrain Clearance) Chart

Radar Minimum Altitude (Radar Terrain Clearance) Charts shall not be designed solely on the location of obstacles but should also take consideration of procedures, operations, airspace and environmental requirements.

The controlling obstacle for each sector shall be at least 3nm from the boundary unless the MOCA of the adjacent sector is higher. (Refer Table 2.12.1-1: Minimum Obstacle Clearance)

16.20 PROCEDURE CONTAINMENT

For procedures within controlled airspace, the primary area of the procedure(s) shall, and the secondary area(s) should, be contained within the controlled airspace. Where procedures cannot be contained within the existing airspace, consideration should be given to apply for appropriate changes to the airspace.

Procedures outside controlled airspace should be designed to remain clear of any controlled airspace, restricted/danger/prohibited areas or areas that could be constituted as a hazard such as glider or blasting areas. Where procedures do overlap these areas, the primary area of the procedure(s) shall, and the secondary area(s) should, remain clear of these airspace.

It is recommended that suitable horizontal and vertical separation be applied between the procedure protection...
areas and the surrounding airspace.

A safety assessment shall be conducted and submitted with the PDP where procedures do not comply with this standard.

16.21 USE OF VARIOUS NAVIGATION SYSTEMS

Before designing procedures requiring the switching between various navigation systems, eg. An RNP-APCH onto an ILS, a study as to the ability of intended aircraft's ability to perform such switching should be conducted and evidence as to their compliance submitted as part of the PDP.

When switching between various navigation systems cannot be avoided, eg. An RNP-APCH onto an ILS, reverting back to the original navigation system should be avoided. Eg. The Missed Approach of the ILS would be be used to the Missed Approach termination point.

The above requirement also applies to Communication Failure Procedures.

17 DESIGN VERIFICATION

The Flight Procedure Designer responsible for the verification of the procedure shall ensure that procedure has been designed and the documentation has been verified for compliance, correctness and completeness in accordance with ICAO design criteria, SA-CAR-173, SA-CATS-FPD and this MOPS.

18 DESIGN MAINTENANCE

All procedures shall be revised and maintained in accordance with ICAO design criteria, SA-CAR-173, SA-CATS-FPD and this MOPS.

19 DESIGN APPROVAL

All procedures shall be submitted to the SACAA in accordance with SA-CAR-173, SA-CATS-FPD and this MOPS.

20 ANNEX 14 OBSTACLE LIMITATION SURFACE ASSESSMENTS

ICAO Annex 14 Obstacle Limitation Surfaces shall be applied to all licensed and registered aerodromes in South Africa, and should be applied for unlicensed aerodromes unless operational limitations at those airfields preclude their usage. The ICAO Annex 14 Obstacle Limitation Surface assessment shall be conducted in accordance with ICAO Annex 14.

The ICAO Aerodrome Reference Code (Code Element 1 – Aerodrome Reference Field Length) shall be based on the actual length of the runway and not the actual length of the runway reduced for altitude and/or temperature.

ICAO Annex 14 Obstacle Limitation Surfaces for Helistops/Heliports are not currently applied. Where ICAO Annex 14 Obstacle Limitation Surfaces for Helistops/Heliports are applied, the assessment shall be conducted in accordance with ICAO Annex 14 Vol II.
PART IV AERONAUTICAL CHARTING STANDARDS

21 COLOUR PALETTE

All colours used conform to ICAO Annex 4, Appendix 3, Colour Guide.

21.1 Build-up Areas

Area Fill: C – 0, M – 0, Y – 50, K – 0
Area Outline: Nil

Labelling Font Size:
Major Cities: Arial, Uppercase, 5pt
Towns: Arial, Upper-and lowercase, 5pt
Smaller towns: Arial, Upper-and lowercase, 4pt
Labelling Colour: C – 0, M – 0, Y – 0, K – 50

Example:
21.2 Hydrography

Shore lines, lakes, rivers Fill: C – 15, M – 5, Y – 0, K – 15
Area Outline: 0.02mm
Outline Colour: C – 100, M – 60, Y – 0, K – 15

Labelling Font Size:
Rivers: Arial, Upper-and lowercase, 3pt – 3.5pt
Dams: Arial, Upper-and lowercase, 3pt – 3.5pt
Shore lines: Arial, Uppercase, 3.5pt
Labelling Colour: C – 100, M – 60, Y – 0, K – 15

Example:
21.3 Topography

Area Outline: 0.01mm
Outline Colour: C – 30, M – 60, Y – 80, K – 0
Fill: As depicted in the example below

Labelling Font Size - Contours: Arial, 3pt
Labelling Colour: C – 30, M – 60, Y – 80, K – 0

Example:

Table 1:

<table>
<thead>
<tr>
<th>C: 0</th>
<th>M: 5</th>
<th>Y: 20</th>
<th>K: 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>C: 0</td>
<td>M: 10</td>
<td>Y: 30</td>
<td>K: 0</td>
</tr>
<tr>
<td>C: 5</td>
<td>M: 15</td>
<td>Y: 40</td>
<td>K: 0</td>
</tr>
<tr>
<td>C: 10</td>
<td>M: 30</td>
<td>Y: 50</td>
<td>K: 0</td>
</tr>
<tr>
<td>C: 15</td>
<td>M: 40</td>
<td>Y: 60</td>
<td>K: 0</td>
</tr>
<tr>
<td>C: 30</td>
<td>M: 60</td>
<td>Y: 80</td>
<td>K: 0</td>
</tr>
<tr>
<td>C: 40</td>
<td>M: 70</td>
<td>Y: 100</td>
<td>K: 0</td>
</tr>
<tr>
<td>C: 50</td>
<td>M: 80</td>
<td>Y: 100</td>
<td>K: 0</td>
</tr>
<tr>
<td>C: 60</td>
<td>M: 80</td>
<td>Y: 100</td>
<td>K: 10</td>
</tr>
</tbody>
</table>

Table 2:

<table>
<thead>
<tr>
<th>C: 0</th>
<th>M: 7</th>
<th>Y: 25</th>
<th>K: 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>C: 0</td>
<td>M: 13</td>
<td>Y: 35</td>
<td>K: 0</td>
</tr>
<tr>
<td>C: 7</td>
<td>M: 23</td>
<td>Y: 45</td>
<td>K: 0</td>
</tr>
<tr>
<td>C: 13</td>
<td>M: 35</td>
<td>Y: 55</td>
<td>K: 0</td>
</tr>
<tr>
<td>C: 23</td>
<td>M: 50</td>
<td>Y: 70</td>
<td>K: 0</td>
</tr>
<tr>
<td>C: 35</td>
<td>M: 65</td>
<td>Y: 90</td>
<td>K: 0</td>
</tr>
<tr>
<td>C: 45</td>
<td>M: 75</td>
<td>Y: 100</td>
<td>K: 0</td>
</tr>
<tr>
<td>C: 55</td>
<td>M: 80</td>
<td>Y: 100</td>
<td>K: 0</td>
</tr>
</tbody>
</table>

Note: Table 1 ought to be used only if a maximum of nine contours are depicted or visible on the chart. If more than nine contours are visible for a specific area, the tints of Table 2 should be incorporated with the colours in Table 1.
### 21.4 Restricted, Prohibited and Danger Areas

Area Outline: 0.05mm  
Hatching: 0.05mm and to be obtained form examples given  
Outline Colour: C – 0, M – 50, Y – 50, K – 0  
Fill: None

Labelling: Arial, Uppercase, 5pt  
Labelling Colour: C – 100, M – 60, Y – 0, K – 15

Example:
21.5 Air Traffic Services Airspace

Area Outline: 0.25mm
Outline Colour: C – 50, M – 50, Y – 0, K – 0
Fill: None
Labelling Colour: C – 50, M – 50, Y – 0, K – 0

Example:
21.6 10 NM Distance Circle

Arial, 6 pt, Normal - 50% Black
Dashed Outline: Hairline - 50% Black
21.7 Spot Heights

21.8 Navigation Aid Information Block

21.9 Latitude & Longitude
21.10 Reporting Point; Holding and Information Block

NIBEX
26°49'25.56"S
027°40'13.41"E
R235/50.6DME MOV

- Arial, Bld, 6.5pt
- Arial, Normal, 5.5pt
- Arial, Bld, 5.5pt
- Arial, Normal, 6pt
- Arial, Normal, 6pt
- Line Thickness, 0.5mm

21.11 Obstacles

170° - Arial, 6 pt, Italic, Bold - 100% Black
(140) - Arial, 6 pt, Italic, Normal - 100% Black

22 CHART EXAMPLES

Enclosed are the current published Aeronautical Charts for reference purposes.
22.1 Aerodrome Chart

**AERODROME CHART 26°08'01.30"S ELEV 5558' 028°14'32.34"E**

**Johannesburg Int'l (CPT) 26°57'27"S 28°00'04"E**

**9 April 2011**

**MANUAL OF PROCEDURES and STANDARDS for PROCEDURE DESIGN & CARTOGRAPHY**

**SAFAIR**

**INTERNATIONAL PIER**

**DOMESTIC PIER**

**SAA Cargo**

**INTERNATIONAL TERMINAL**

**CENTRAL TERMINAL BUILDING**

**DOMESTIC TERMINAL**

**FIRE STATION**

**SUPER SOUTH PARKING**

**CAUTION**

With reference to the commencement of A380 movements at D.R. Tshwane Int.
1. A building obstruction is penetrating the A380 safety zone adjacent to TWY E and TWY J, respectively.
2. The action of the building affecting the safety zone is marked in white and red dots.

**NOTE**

1. RWY 03L/21R operational only in CAT II conditions.
2. Exercise caution as deep ponding occur on RWY after heavy rain.
3. In strong WR conditions severe wind shear can be expected below 300'with approach to RWY 03L due to proximity of hangars.

**RYW LIGHTING**

<table>
<thead>
<tr>
<th>RWY</th>
<th>ALS</th>
<th>PAPI</th>
<th>RNL</th>
<th>RENL</th>
</tr>
</thead>
<tbody>
<tr>
<td>03L</td>
<td>18&quot;</td>
<td>RED</td>
<td>3&quot;</td>
<td>GREEN</td>
</tr>
<tr>
<td>21R</td>
<td>18&quot;</td>
<td>RED</td>
<td>3&quot;</td>
<td>GREEN</td>
</tr>
<tr>
<td>03R</td>
<td>18&quot;</td>
<td>RED</td>
<td>3&quot;</td>
<td>GREEN</td>
</tr>
<tr>
<td>21L</td>
<td>18&quot;</td>
<td>RED</td>
<td>3&quot;</td>
<td>GREEN</td>
</tr>
</tbody>
</table>

**AD-01**

---

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**Issue Number:** 3  
**Document Classification:** Restricted  
**Page 34 of 61**
22.2 Ground Movement Chart

**AERODROME GROUND MOVEMENT CHART**

**ELEV 5558'**

**JOHANNESBURG INTL**

**G.O.R. TAMBO INTERNATIONAL**

**FAJS**

**APPS**
- 126.90
- 124.80
- 122.85
- 120.90

**APR**
- 126.90
- 124.80
- 122.85
- 120.90

**TRW**
- 119.90
- 118.60

**CAUTION**

With reference to the commencement of 350 movements at O.R. Tambo Int.

1. A building obstruction is penetrating the A300 safety zone adjacent to TWY B between
   TYP E and TYP L respectively.
2. The section of the building affecting the safety zone is marked in white and red strips.

**LEGEND**

- TAXIWAY HOLDING POSITION - PRECISION APPROACH RWY
- INTERMEDIATE HOLDING POSITION MARKING
- AERODROME REFERENCE POINT
- FIRE STATION
- GOLF APRON
- DELTA APRON
- FOXOTR APRON
- ALPHA APRON
- BRAVO APRON
- DOMESTIC TERMINAL
- CHARLIE APRON
- MIKE APRON
- ATNS RADAR
- ECHO APRON

**NOTE**

1. Taxiway Edge and Centre Line Lighting: Blue
   Only used in lights provided.
2. Taxiway Width, Surfaces & Strength: Width: 30 m except for ECHO which is 60 m
   Surfaces: ASPH
   PCN: 50F/5W/W

**PHYSICAL CHARACTERISTICS**

<table>
<thead>
<tr>
<th>RWY</th>
<th>DIRECTION (T)</th>
<th>THR COORDINATES</th>
<th>ELEVATION STRENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>02L</td>
<td>016°</td>
<td>5558'</td>
<td>PCN</td>
</tr>
<tr>
<td>21R</td>
<td>196°</td>
<td>5505'</td>
<td>711/FW/R/T</td>
</tr>
<tr>
<td>02L</td>
<td>196°</td>
<td>5510'</td>
<td>PCN</td>
</tr>
<tr>
<td>21L</td>
<td>196°</td>
<td>5484'</td>
<td>50F/5W/W</td>
</tr>
</tbody>
</table>

**EF: 11 MAR 10**

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**Page:** 35 of 61
22.3 Aerodrome Hot Spot Chart

**AERODROME CHART**

**ELEV 4457'**

**ATIS 126.45**

**TWR 120.80**

**APP 124.30**

**BLOEMFONTEIN**

**(BRAM FISCHER INTL)**

**(FABL)**

---

**AERODROME HOT SPOTS**

<table>
<thead>
<tr>
<th>HOT</th>
<th>RWY</th>
<th>DIRECTION</th>
<th>THR</th>
<th>GND</th>
<th>BEARING</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWY A &amp; B and C</td>
<td>02</td>
<td>360° (T)</td>
<td>29°06'18.22&quot;S</td>
<td>028°18'14.27&quot;E</td>
<td>76/F/B/W/T</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>180°(T)</td>
<td>29°04'55.87&quot;S</td>
<td>028°18'14.27&quot;E</td>
<td></td>
</tr>
<tr>
<td>TWY A &amp; C</td>
<td>12</td>
<td>101°(T)</td>
<td>29°05'23.42&quot;S</td>
<td>028°17'37.46&quot;E</td>
<td>57/F/B/W/T</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>281°(T)</td>
<td>29°05'37.06&quot;S</td>
<td>028°18'28.91&quot;E</td>
<td></td>
</tr>
</tbody>
</table>

---

**CAUTION**

1. Pilots are to exercise caution and must familiarise themselves with the TWY designations, and apply extra vigilance around the designated “Hot Spot” area.
2. The intersection around TWY A, B and C, are designated “Hot Spots” and as such extra vigilance is required by pilots.
3. No aircraft may pass each other on the taxiways at the intersection.
4. Exercise caution when landing as strong tailwind or crosswind can be expected above the surface with calm surface wind conditions.
5. Bird activity on manoeuvring area.

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Version: Re-Issue
Latest revision: 8 July 2011
Document Classification: Restricted
Effective Date: 28 FEBRUARY 2013
Issue Number: 3
Page 36 of 61
22.4 Standard Terminal Arrival Chart

STANDARD ARRIVAL CHART
INSTRUMENT (STAR)

ELEV, ALT & HGT IN FEET
DIST IN NM
BRG ARE MAG
VAR 18° W

TRANSITIONAL ALTITUDE
8600' TRANSATIONAL LEVEL

ATC

RADAR APP E 124.50
E 124.50
W 118.10
W 118.10
DIR 121.40
DIR 121.40
ACO N 126.70
ACO N 126.70
SNC 121.90
SNC 121.90

JOHANNESBURG
(R.O. TAMBO INTERNATIONAL)
RWY 03R
OKPIT 4A

OKPIT 4A
RWY 03R

OKPIT on R052 JSV (INBD) to intercept R031 HGV (INBD) for radar vectoring onto the ILS RWY 03R.

COMMUNICATION FAILURE PROCEDURE (Squawk 7600)

Before OKPIT:
Proceed to OKPIT and enter the OKPIT hold. Hold at last assigned level for minimum 5 minutes, then descend to FL130 in the hold, or maintain last assigned level if below FL130. Leave OKPIT on the "After OKPIT" Communication Failure Procedure.

After OKPIT:
Continue on the routing for the OKPIT 4A STAR. Crossing R052 JSV, while established on R031 HGV, descend to FL100. Passing 15 DME JSV on R031 HGV turn right onto track 30°1' and descend to 3000' ALT. Crossing R026 JSV turn right onto track 001°1' to intercept the LOC RWY 03R. Complete a straight-in ILS APCH and land RWY 03R.

Note:
Aircraft entering the TMA at FL110 and below are to enter the OKPIT hold at last assigned level, and continue on the routing for the OKPIT 4A STAR.

Caution:
Holding patterns below FL110 will be conducted outside of controlled airspace. Pilots are to take note of the appropriate FABAs. In the event of a missed approach with the intention of diverting to an alternate aerodrome, proceed as follows:
To the North and North-West: Follow the routing for the varsu 3A SIDs.
To the East and North-East: Follow the routing for the EGMEN 2A SID (jet ACFT) or EX051 1A SID (Turbo-prop ACFT).
To the South-East: Follow the routing for the ADPAK 3A SIDs.
To the West and South-West: Follow the routing for the RAGUL 3A SIDs.

COMMUNICATION FAILURE PROCEDURE (Squawk 7600)

Before OKPIT:
Proceed to OKPIT and enter the OKPIT hold. Hold at last assigned level for minimum 5 minutes, then descend to FL130 in the hold, or maintain last assigned level if below FL130. Leave OKPIT on the "After OKPIT" Communication Failure Procedure.

After OKPIT:
Continue on the routing for the OKPIT 4A STAR. Crossing R052 JSV, while established on R031 HGV, descend to FL100. Passing 15 DME JSV on R031 HGV turn right onto track 30°1' and descend to 3000' ALT. Crossing R026 JSV turn right onto track 001°1' to intercept the LOC RWY 03R. Complete a straight-in ILS APCH and land RWY 03R.

Note:
Aircraft entering the TMA at FL110 and below are to enter the OKPIT hold at last assigned level, and continue on the routing for the OKPIT 4A STAR.

Caution:
Holding patterns below FL110 will be conducted outside of controlled airspace. Pilots are to take note of the appropriate FABAs. In the event of a missed approach with the intention of diverting to an alternate aerodrome, proceed as follows:
To the North and North-West: Follow the routing for the varsu 3A SIDs.
To the East and North-East: Follow the routing for the EGMEN 2A SID (jet ACFT) or EX051 1A SID (Turbo-prop ACFT).
To the South-East: Follow the routing for the ADPAK 3A SIDs.
To the West and South-West: Follow the routing for the RAGUL 3A SIDs.

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22.5 Standard Instrument Departure Chart

STANDARD DEPARTURE CHART - INSTRUMENT (SID)

ELEV, ALT & HGT IN FEET
DIST IN NM
BRG ARE MAG
VAR 18°W (20000)

JOHANNESBURG
O.R. TAMBO INTERNATIONAL
RWY 03L
EGMEN 2A

NOTE
1. If unable to comply with SID or STAR, notify ATC.
2. SID’s and STAR’s must be announced in operation on ATIS.
3. SID’s and STAR’s only in force when Surveillance Radar is in operation.
4. At 600’ ALT contact Johannesburg Radar (APP) on frequency provided.
5. Cross CTR boundary at or above 6000’ AGL.
6. General Aviation Traffic operates below the TMA up to 7500’ ALT and is considered separated from traffic operating in the TMA.

EGMEN 2A, RWY 03L
Climb to FL090, maintain RWY HDG to 5.5 DME JSV then turn right to intercept R275 WIV (INBD). At 23.4 DME JSV turn left Onto track 030° to intercept R078 JSV (OUBD) to EGMEN. Cross 15 DME JSV at FL090 or above.
Restricted to a minimum climb gradient of 4.5% to CTR boundary.
4.5% @ 145KT IAS = 638 FPM
4.5% @ 165KT IAS = 620 FPM
4.5% @ 220KT IAS = 1030 FPM

COMMUNICATION FAILURE PROCEDURE (Squawk 7600)
Comply with EGMEN 2A SID, climbing to FL090 or maintain last assigned level, whichever is the highest. At EGMEN set course as per flight plan and climb to flight plan level.
Aircraft wishing to return must continue to the SID termination point and climb to the last assigned level or MSA. If cleared level is below MSA, at EGMEN proceed to OKPT1 and comply with the OKPT1A RWY 03R STAR Communication Failure Procedure.

EGMEN 2A
20°04’40” S 21°25’00” E R0785/DOME JSV

JOHANNESBURG
VOR 113.3
JSV VOR

WITBANK
VOR 113.3
WIV 175°
20°11’40” S 21°48’05” E

M 554

20°10’ 20°40’
0 5 10 15 20 25 30
0 5
10 NM

8000

7000

6000

EGMEN 2A

5473’

JSV

5237’

R275 WIV

113°

20°04’40” S
21°25’00” E

DEP-01

EFP: 11 MAR 10

Version: Re-Issue
Latest revision: 8 July 2011
Effective Date: 28 FEBRUARY 2013
Issue Number: 3
Document Classification: Restricted
Page 38 of 61
22.6 Instrument Approach Chart

**INSTRUMENT APPROACH CHART**

**AERODROME ELEV 5558'**

**HEIGHTS RELATED TO**

**THR RWY 03L - ELEV 5558'**

**JOHANNESBURG (O.R. TAMBO INTERNATIONAL)**

**ILS RWY 03L**

**CAT A-D**

**MISSING APC H CH MOD CHARGE**

**PROCEDURE**

**Close to 9000 ALT, Maintain RWY track to 3.5 DME JSI, then turn left**

**Crossing R210 WVK turn left onto HDG 265°, then turn left onto RWY 03L**

**At 3.5 DME WVK turn left (MAX 20 Knot IAS) onto HDG 300° and descend to 8000 ALT**

**Crossing R210 WVK turn left onto HDG 060° to intercept the ILS LOC RWY 03L**

**At 3.5 DME RWV descend to 9000 ALT and complete a straight-in ILS APC H**

**ÚVOR and DME REQUIRED**

**MISSING APC H CH MOD CH**

**PROCEDURE**

**Close to 9000 ALT, Maintain RWY track to 3.5 DME JSI, then turn left**

**Crossing R210 WVK turn left onto HDG 265°, then turn left onto RWY 03L**

**At 3.5 DME WVK turn left (MAX 20 Knot IAS) onto HDG 300° and descend to 8000 ALT**

**Crossing R210 WVK turn left onto HDG 060° to intercept the ILS LOC RWY 03L**

**At 3.5 DME RWV descend to 9000 ALT and complete a straight-in ILS APC H**
22.7 RNAV (GNSS) Chart

ELEV, ALT & HGT IN FEET
DIST IN NM
BRG ARE MAG
VAR 18°W (2000)

TRANITIONAL ALTITUDE
8000'
TRANITIONAL LEVEL
ATC

JOHANNESBURG
O.R. TAMBO INTERNATIONAL
RNAV (GNSS) RWY 03L
EGMEN TC

B4000
M2A 20 NM
FAJIS AIP

EGMEN
20°38'40"S
28°56'58.53"E
REDUCE RANGE 25K

NOTE
1. If unable to comply with SID or STAR, request ATC.
2. SID's and STAR's must be announced in operation on ATIS.
3. SID's and STAR's only in force when Surveillance Radar is in operation.
4. AT 6000' ALT contact Johannesburg Radar (APP) on frequency provided.
5. Cross CTR boundary at or above 6000' ALT.
6. General Aviation Traffic operates below the TMA up to 7500' ALT and is considered separated from traffic operating in the TMA.

ELEV. 7000
EGMEN 1C, RWY 03L
Climb to FL090, maintain RWY track to J9031. At J9031 turn right to J9032. At J9032 turn left to EGMEN. Further climb will be under radar control. At EGMEN set course as per flight plan and climb to flight plan level.

Restriction to a minimum climb gradient of 4.1% to CTR boundary.
4.1% @ 14000'IAS = 501 FPM
4.1% @ 16000'IAS = 747 FPM
4.1% @ 22000'IAS = 913 FPM

COMMUNICATION FAILURE PROCEDURE (Squawk 7600)
Comply with EGMEN 1C SID, climbing to 6000' ALT or maintain last assigned level, whichever is the highest. At EGMEN set course as per flight plan and climb to flight plan level.
Aircraft wishing to return must continue to the SID termination point and climb to the last assigned level or MSA if cleared level is below MSA. At EGMEN proceed to OKPIT and comply with the OKPIT 4A RWY 03R STAR Communication Failure Procedure.

CHANGE: New Procedure

EFF: 11 MAR 10

DEP-10

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Issue Number: 3
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Page 40 of 61
### 22.8 RNAV (GNSS) Tabular Chart - Departure

**AERONAUTICAL DATA TABULATION**

**JOHANNESBURG (O.R. TAMBO INTERNATIONAL) RNAV (GNSS) RWY 03L EGMEN 1C**

<table>
<thead>
<tr>
<th>FIXWAYPOINT</th>
<th>LATITUDE</th>
<th>LONGITUDE</th>
<th>COURSE (°T)</th>
<th>DISTANCE (NM)</th>
<th>PATH TERMINATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>DER</td>
<td>26°36'29.33&quot;S</td>
<td>028°14'46.07&quot;E</td>
<td>015.8</td>
<td>5.9</td>
<td>CF</td>
</tr>
<tr>
<td>JS031</td>
<td>26°00'40.85&quot;S</td>
<td>028°16'34.04&quot;E</td>
<td>077.9</td>
<td>22.8</td>
<td>TF</td>
</tr>
<tr>
<td>JS032</td>
<td>25°55'59.62&quot;S</td>
<td>028°41'15.69&quot;E</td>
<td>041.8</td>
<td>22.8</td>
<td>TF</td>
</tr>
<tr>
<td>EGMEN</td>
<td>26°28'45.74&quot;S</td>
<td>028°58'05.53&quot;E</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CHANGE: Location Indicator F/AOR**

**EFF: 10 JAN 13**

**DEP-10A**

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**Issue Number:** 3

**Document Classification:** Restricted

Page 41 of 61
22.9 RNAV (GNSS) Tabular Chart - Arrival

<table>
<thead>
<tr>
<th>FIXWAYPOINT</th>
<th>LATITUDE</th>
<th>LONGITUDE</th>
<th>COURSE (°)</th>
<th>DISTANCE (NM)</th>
<th>PATH TERMINATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>STV</td>
<td>26°41'48.19&quot;S</td>
<td>028°52'02.86&quot;E</td>
<td>290.6</td>
<td>30.7</td>
<td>IF</td>
</tr>
<tr>
<td>JSV17</td>
<td>26°30'55.34&quot;S</td>
<td>028°19'38.87&quot;E</td>
<td>193.9</td>
<td>11.2</td>
<td>IF</td>
</tr>
<tr>
<td>ETJUG</td>
<td>26°41'48.05&quot;S</td>
<td>028°50'29.66&quot;E</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ENR HOLDING**

<table>
<thead>
<tr>
<th>FACILITY</th>
<th>INBOUND HEADING/RADIAL</th>
<th>MAX FL</th>
<th>FACILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>STV</td>
<td>351°/MR171</td>
<td>FL280</td>
<td>Right hand racecourse pattern. 1 minute at or below FL140. 1 minute 30 seconds above FL140.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FL090</td>
<td></td>
</tr>
</tbody>
</table>

**Bernard: Retractable Holding Point RVR**

**E harming: Retractable Holding Point RVR**

**EFF: 10 JAN 13**

**ARR-10A**
22.10 Radar Terrain Clearance Chart
22.11 Aerodrome Obstacle Chart Type A
22.12 Precision Approach Terrain Chart
23 CHART VERIFICATION
The Flight Procedure Designer responsible for the verification of the charting shall ensure that procedure has been designed and the documentation has been verified for compliance, correctness and completeness in accordance with ICAO charting criteria, SA-CAR-173, SA-CATS-FPD and this MOPS.

24 CHART MAINTENANCE
All charts shall be revised and maintained in accordance with ICAO design criteria, SA-CAR-173, SA-CATS-FPD and this MOPS.

25 CHART APPROVAL
All charts shall be submitted to the SACAA in accordance with SA-CAR-173, SA-CATS-FPD and this MOPS.

PART V MISCELLANEOUS

26 DOCUMENT CONTROL AND AUTHORISATION
A file containing the complete PDP, including all approved and disapproved amendments, as well as a copy of the approval certificate, must be held in the PD&C section for reference as long as that procedure is active.

27 CONTINUOUS IMPROVEMENT, MEASUREMENT AND ANALYSIS
This MOP will be verified or continuously improved on in accordance with SACAA Continuous Improvement, Measurement and Analysis GP001 – Standardised

28 RECORDS

<table>
<thead>
<tr>
<th>RECORD NAME</th>
<th>STORAGE LOCATION</th>
<th>RESPONSIBILITY</th>
<th>MINIMUM RETENTION PERIOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDP</td>
<td>PD&amp;C</td>
<td>PD&amp;C: Admin Officer</td>
<td>10 Years after the discontinuation of the procedure.</td>
</tr>
<tr>
<td>Procedure Approval Certificates</td>
<td>PD&amp;C</td>
<td>PD&amp;C: Admin Officer</td>
<td>10 Years after the discontinuation of the procedure.</td>
</tr>
<tr>
<td>Validation Report</td>
<td>PD&amp;C</td>
<td>PD&amp;C: Admin Officer</td>
<td>10 Years after the discontinuation of the procedure.</td>
</tr>
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<td>Electronic Procedure Design Files</td>
<td>PD&amp;C</td>
<td>PD&amp;C: Admin Officer</td>
<td>10 Years after the discontinuation of the procedure.</td>
</tr>
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<td>Aeronautical Charts</td>
<td>PD&amp;C</td>
<td>PD&amp;C: Admin Officer</td>
<td>10 Years after the discontinuation of the procedure.</td>
</tr>
</tbody>
</table>
29 DOCUMENT AUTHORISATION AND CONTROL

This MOP is a living document. If, as a result of development in, or an amendment to the scope and functions of this Department /Section, or possibly even developments in the aviation industry that necessitate changes, changes must be made and this MOP must be amended. Every member of this Department /Section is encouraged to propose ideas and changes to this document for the general improvement both of the content and of the professional execution of their duties.

The PD&C Section reports directly to SM: ANS who in turn reports to GM: ASI and is therefore authorised by this incumbent. The Senior Manager: ANS is responsible for the Validation Process MOP and proposes any amendments to the GM: ASI. The GM: ASI remains accountable for the MOP and approves MOP amendments.

<table>
<thead>
<tr>
<th>DEVELOPED BY:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GM NEWMAN</td>
<td>28 FEBRUARY 2013</td>
<td></td>
</tr>
<tr>
<td>SIGNATURE OF MANAGER:</td>
<td>NAME IN BLOCK LETTERS</td>
<td>DATE</td>
</tr>
<tr>
<td>PD&amp;C</td>
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</tbody>
</table>

| REVIEWED & VALIDATED BY:       |                |                |
| C ASHFORD                      | 28 FEBRUARY 2013 |                |
| SIGNATURE OF ACTING SENIOR MANAGER: ANS | NAME IN BLOCK LETTERS | DATE |

| APPROVED BY:                  |                |                |
| G BESTBIER                     | 28 FEBRUARY 2013 |                |
| SIGNATURE OF GENERAL MANAGER: ASI | NAME IN BLOCK LETTERS | DATE |
ANNEX - A

Procedure Design process – Version 1.0 (page 1)

ATNS

Data Source - Collect and validate Data
Create conceptual designs
Review by stakeholders
Accept

Other SP

Create conceptual designs
Review by stakeholders
Accept

SACAA

Apply PANS-OPS criteria
PANS-OPS Compliant?
Yes

Regulator participation

Process Flow Direction

continued......
Originally, IDEF was developed to enhance communication among people trying to understand the “system”. Now, IDEF is being used for documentation, understanding, design, analysis, planning, and Integration.

**IDEF0 explained**

This is what IDEF0 does:

As a function modeling language, IDEF0 has the following characteristics:

- It is comprehensive and expressive, capable of graphically representing a wide variety of business, processes and other types of enterprise operations to any level of detail.
- It is a coherent and simple language, providing for rigorous and precise expression, and promoting consistency of usage and interpretation.
- It enhances communication between Process developers and users through ease of learning and its emphasis on hierarchical exposition of detail.

**Overview**

- Function: An activity, process, or transformation (modeled by an IDEF0 box) identified by a verb or verb phrase that describes what must be accomplished.
- Decomposition: The partitioning of a modeled function into its component functions
- **A-0 Diagram**: The special case of a one-box IDEF0 context diagram, containing the top-level function being modeled and its inputs, controls, outputs and mechanisms, along with statements of model purpose and viewpoint. Level 1 etc. follows as decomposed child diagrams.
- **Box**: A rectangle, containing a name and number, used to represent a function, from 3 to 6 per diagram, except on A-0.
Arrow: A directed line, composed of one or more arrow segments, that models an open channel or conduit conveying data or objects from source (no arrowhead) to use (with arrowhead). There are 4 arrow classes: Input Arrow, Output Arrow, Control Arrow, and Mechanism Arrow.

Box Name: The verb or verb phrase placed inside an IDEF0 box to describe the modeled function.

Box Number: The number (0 to 6) placed inside the lower right corner of an IDEF0 box to uniquely identify the box on a diagram.

Arrow Label: A noun or noun phrase associated with an IDEF0 arrow or arrow segment, specifying its meaning.

Arrow Segment: A line segment that originates or terminates at a box side, a branch (fork or join), or a boundary (unconnected end).

Boundary Arrow: An arrow with one end (source or use) not connected to any box on a diagram. Contrast with Internal Arrow.

Control Arrow: The class of arrows that express IDEF0 Control, i.e., conditions required to produce correct output. Data or objects modeled as controls may be transformed by the function, creating output. Control arrows are associated with the top side of an IDEF0 box.

Input Arrow: The class of arrows that express IDEF0 Input, i.e., the data or objects that are transformed by the function into output. Input arrows are associated with the left side of an IDEF0 box.

Output Arrow: The class of arrows that express IDEF0 Output, i.e., the data or objects produced by a function. Output arrows are associated with the right side of an IDEF0 box.

Mechanism Arrow: The class of arrows that express IDEF0 Mechanism, i.e., the means used to perform a function; includes the special case of Call Arrow. Mechanism arrows are associated with the bottom side of an IDEF0 box.

Decomposition
Decomposition: The partitioning of a modeled function into its component functions.

Child Diagram: The diagram that details a parent box.

Child Box: A box on a child diagram.

Relationship: The relationship between functions is indicated by relative position and arrows.
MANUAL OF PROCEDURES and STANDARDS for PROCEDURE DESIGN & CARTOGRAPHY
ANNEX – C PROCEDURE DESIGN PACKAGE (PDP)

The PDP shall be supplied to the SACAA for the validation of flight procedures and will consist of the following documentation, data, information and electronic files as a minimum. This list is not exhaustive and additional documents can be added to the PDP or be requested by the SACAA for validation purposes.

Design Report:

- The Design Report shall at least contain the following information:
  - Airport Name & ICAO Location Indicator.
  - Procedure Name, Runway Designator, version number & version date.
  - Record of Changes.
  - Name of the design organisation, flight procedure designer who designed the procedure and flight procedure designer who verified and checked the procedure.
  - File name of Electronic Design Files, Enclosures, Appendixes and Source Documents, including version number & version date.
  - Supporting Information/Data used in the design.
  - Version of ICAO Doc 8168 Vol II
  - Software used for the design, including software version.
  - Projection(s) and projection parameters.
  - Details, methodology & assumptions used and alternative options considered by the designer. For any deviation from existing standards, the reasons for such a deviation and details of the mitigations applied to assure continued safe operations (based on safety cases or aeronautical studies).

  **Note:** Even though ICAO Doc 8168 Vol II does not consider contingency/emergency procedures in the design, possible contingency/emergency procedures should still be considered in the design to assist with safety during a critical phase of flight.

- PBN Application/Nav Specification.
- Design Parameters and/or Calculations (including source data used in the calculations) to be provided in a chronological and unambiguous manner.

  **Example:** True Headings/Tracks/Radials/Bearings, Magnetic Variation applied (including origin & epoch) & Magnetic Headings/Tracks/Radials/Bearings  
  (Track 025°T + 21.5°W VAR (FAJS 2009) = 046.5°M ≈ 047°M).

- Airspace constraints or considerations.
- Segment Climb/Descent Gradient. Where the Missed Approach Climb Gradient exceeds 2.5%, the Required Missed Approach Climb Gradient shall be specified as well as an OCA/H for a 2.5% Missed Approach Climb Gradient.
- Obstacle Assessment per segment:
  - Segment start and end points.
Manually edit the text.
Supplementary Information:

- Any additional documentation, information or data that will facilitate the validation of the procedure(s) or chart(s). These documents shall include, but are not limited to:
  - Supplementary charts/images, adequately annotated and labelled to fit the purpose of the chart/image.
  - ICAO Annex 14 OLS assessments.
  - Aeronautical studies/Safety cases.

Recommendation: Aeronautical Studies/Safety Cases should be done in accordance with the EuroControl Safety Case Development Manual, as amended.

- Approved User Requirement Specification (URS).
- Proof of Consultation with clients & affected parties.
- Information/documentation of environmentally sensitive areas considered in the design (EIA documentation/requirements).

Note: “Safety shall always be the highest priority, however the competent authorities of each State could set subordinate priorities for capacity or environmental protection. When a noise abatement committee, which may lack adequate knowledge of procedure design, is involved in the development of departure procedures, it is essential that the importance to safety of the PANS-OPS criteria are made transparent to this committee. In cases where a State is required to deviate from PANS-OPS, it is strongly recommended that an aeronautical study be conducted to assess the effect on safety. This applies in all cases, even where political pressure for change is strong.” – ICAO Doc 8168 Vol II Part 1 Section 3 Chapter 3 Appendix to Chapter 2 Par 2.3

- Communication, Navigation & Surveillance (CNS) information such as Nav Aid designator, frequencies, Line of Sight calculations, etc.
ANNEX - D

Validate Procedures

<table>
<thead>
<tr>
<th>Activity level</th>
<th>A0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Validate procedures</td>
</tr>
</tbody>
</table>

### Input

- **Procedure Design Package**: This Package include all elements for SACAA to be able to carry out Ground and Flight Validation activities. A Procedure Design Package checklist will be issued by SACAA and submittal will be checked against this checklist.

### Output

- **Validated procedures**: This is the final output from the validation process and its content will be described in an ICAI template.

### Control

- **ICAO Docs**: These include Annex-15, DOC 8168 and Doc 9906.
- **SACAA CAR Part 178**: This is the CAA regulation pertaining to Procedure Design activities.
- **SACAA Safety Manual**: This describes the SACAA safety policy.

### Mechanism

- **Validation Staff**: These include PANS-OPS specialists, PANS-OPS technicians and Flight Validation aircrew. It also describes relevant competency and training required to fulfill each role.
- **Validation Hardware and Software**: These include specialized hard and software to validate procedures to ensure compliance and to ensure integrity.
- **Office equipment**: This describes the normal day to day equipment required to fulfill each function. i.e. MS Office, printers, desks, etc.
- **Office space**: This describes the office space required for Validation activities.

### Notes
### Activity level: Carry out Ground Validation

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Procedure Design Package</td>
</tr>
<tr>
<td>Output</td>
<td>Validated procedures</td>
</tr>
<tr>
<td>Control</td>
<td>ICAO Doc 8168/Rev II, Part 1, Section 2, Chapter 4</td>
</tr>
<tr>
<td></td>
<td>ICAO Annex 15</td>
</tr>
<tr>
<td></td>
<td>SACAA CAR Part 178</td>
</tr>
<tr>
<td></td>
<td>SACAA CATS IFPD</td>
</tr>
<tr>
<td></td>
<td>SACAA MOP</td>
</tr>
<tr>
<td>Mechanism</td>
<td>Ground Validation software</td>
</tr>
<tr>
<td></td>
<td>Trained Ground validation staff</td>
</tr>
<tr>
<td></td>
<td>Office equipment</td>
</tr>
<tr>
<td></td>
<td>Office space</td>
</tr>
</tbody>
</table>

### Version: Re-Issue  
Latest revision: 8 July 2011  
Effective Date: 28 FEBRUARY 2013  
Issue Number: 3  
Document Classification: Restricted
### Activity: Carry out Flight Validation

**Activity level:** A2-2

#### Input

**Ground validated procedures**
- These are procedures that have passed the Ground validation phase that require Flight Validation.

#### Output

**Flight Validated procedures**
- These are the procedures that have passed the Flight Validation activities that are ready for publication.

#### Control

- **SACAA CAR - Part 178**: The CAR states the Validation requirement and describes roles and responsibilities.
- **SACAA CATS - IFPD**: The CATS document defines the technical requirement of IFPD.
- **ICAO DOC 9906 Vol 5 and 6**: This document describes how Flight Validation is to be carried out and what crew qualifications required.
- **SACAA MOP**: The Manual of Operating Procedures (this document) describes the quality process to achieve a quality Validation output.
- **AIP procedure template**: This is the template required as input to the ICAO publication process.

#### Mechanism

- **Flight Validation aircraft**: Suitable aircraft will be required to carry out the Flight validation activities.
- **Flight Validation crew**: Special crew training is required i.e. Some detailed training in PANS-OPS.
- **Pre and post briefing facilities**: Suitable facilities are required to brief and debrief flight validation crew.

### Notes

- **ICAO**
  - **Annex 15**
  - **Doc 8168 Vol II**
- **SACAA**
  - **MOP**
  - **Software**
- **IAOP**
  - **Template**
- **ICAO Doc 9906 Vol 5 and 6**
- **IFP Package Checklist**
- **SACAA MOP**
- **PANS-OPS Technician**
- **PANS-OPS Qualified staff**
- **Access To National Database**
- **Geographical Software**
- **CRC Software**
- **Validation Software For RNAV**
- **ICAO Doc 9188 VOL II**
- **ICAO Doc 9905 Vol II and 6**
- **CRC Software**
- **SACAA MOP**
- **PANS-OPS Senior staff**
- **Access To National Database**
- **CRC Software**

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**Version:** Re-Issue  
**Effective Date:** 28 FEBRUARY 2013  
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**Issue Number:** 3  
**Document Classification:** Restricted
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<tr>
<th>Activity level</th>
<th>Check procedure Package</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>Procedure Design Package</td>
<td>This Package include all elements for SACAA to be able to carry out Ground and Flight Validation activities. A Procedure Design Package checklist will be issued by SACAA and submittal will be checked against this checklist. It is important to note that the Service Provider should have requested an Obstacle &quot;snap shot&quot; from SACAA before they started with any design and this dataset will form part of their submission.</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>Request for correction</td>
<td>This is data and information that are lacking or incomplete that require correction or re-submittal</td>
</tr>
<tr>
<td>Checked procedure Package</td>
<td>This is checked and complete Procedure design package.</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>IFP Package checklist</td>
<td>This checklist is specified in the SACAA Validation MOPS and will be made available to all Service Providers to comply with.</td>
</tr>
<tr>
<td>SACAA MOP</td>
<td>The Manual of Operating Procedures (this document) describes the quality process to achieve a quality Validation output.</td>
</tr>
<tr>
<td><strong>Mechanism</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>PANS-OPS Technician</td>
<td>Basic aeronautical training/background is required</td>
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<td><strong>Notes</strong></td>
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<table>
<thead>
<tr>
<th>Activity level</th>
<th>Check Obstacle, terrain and Navigational data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>Checked procedure Package</td>
<td>This is checked and complete Procedure design package.</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>Request for correction</td>
<td>This is data and information that are lacking or incomplete that require correction or re-submittal</td>
</tr>
<tr>
<td>Checked Data and Information to be assessed</td>
<td>This is data and information that has passed the Obstacle, terrain and navigational data checking function and requires assessment to ascertain if Flight simulation or Flight validation is required.</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>SACAA MOP</td>
<td>The Manual of Operating Procedures (this document) describes the quality process to achieve a quality Validation output.</td>
</tr>
<tr>
<td><strong>Mechanism</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>ICAO DOC 8168 Volume II</td>
<td>Procedures will be checked against this document.</td>
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<tr>
<td>ICAO ANNEX-15</td>
<td>Obstacle and terrain data accuracy, integrity and resolution will be checked against this standard.</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
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</tbody>
</table>

1. The SACAA procedure design section still need a procedure design capability to check designs or to design procedures in extreme cases.
<table>
<thead>
<tr>
<th>ANNEX – E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flight simulation required</strong></td>
</tr>
<tr>
<td>SID’s with demanding climb gradients and level restrictions.</td>
</tr>
<tr>
<td>RNP AR type procedures.</td>
</tr>
<tr>
<td>Airspace containment</td>
</tr>
<tr>
<td>Procedures that will impact on other procedures in complex airspace.</td>
</tr>
<tr>
<td>Where a large amount of procedures are introduced at the same time in the same airspace or adjoining airspace.</td>
</tr>
</tbody>
</table>

**Note:** For large airspace change projects, it might not be economically viable to Flight Validate all procedures and therefore only the most demanding procedures should be Flight Validated.

| **Flight validation required** |
| New procedures where there are no published procedures to the same RWY. |
| Procedures that contain non-standard design elements (deviation from criteria e.g. non-standard approach angles/steep approach, non-standard segment lengths, speeds, bank angles etc.) |
| When accuracy/integrity of data used in the IFP design and/or the Aerodrome environment is not assured. |

| **Night Flight validation required** |
| New procedures to a new airport. |
| Where road or ambient light could confuse a pilot on final approach i.e parallel road lighting running next to a runway or a sporting stadium situated near a threshold. |
| If the approach lighting system installed does not comply with ICAO or National standards. |