SOUTH AFRICAN

CIVIL AVIATION AUTHORITY

TECHNICAL GUIDANCE MATERIAL
for
Flight Procedure Design and Cartography

Table of Contents

1 INTRODUCTION

1.1 This TGM is a directive upon all professionals charged with the responsibility for conducting the Instrument Flight Procedure Design.

Note:

- *Compliance with this manual, however, is not a substitute for common sense and sound judgment.*
- *This TGM will be used by Procedure Design & Cartography professionals designated and or certified by the Director of Civil Aviation as Authorised Officers or FPDO (Flight Procedure Organisations) in terms of Section 88(1)(a) of the Civil Aviation Act of 2009 (Act No. 13 of 2009) and external Service Providers.*

2 SCOPE

This document is aimed at providing guidance to Procedure Design & Cartography professionals appointed in carrying out Procedure Design and Cartography functions within the Republic of South Africa.

3 PURPOSE

The purpose of this TGM is to provide guidance to Procedure Design & Cartography professionals in the performance of their duties. It is written to ensure that standards are applied that promote the safe conduct of civil aviation.

4 AUTHORISATION

Compiled & Reviewed By	SENIOR MANAGER: AIR NAVIGATION SERVICES		
Name in Block Letters	Mr. Sandile Maphanga		
Signature		Date	01 AUGUST 2023
Approved By	EXECUTIVE: AVIATION SAFETY INFRASTRUCTURE		
Name in Block Letters	Mr. Gawie Bestbier		
Signature		Date	01 AUGUST 2023

5 RECORD OF AMENDMENTS

All amendments to this Technical Guidance Material must be made in accordance with GP002 which contains the Manual Amendment Procedure.

Amendment Number	Pages Affected	Date Amended	Approved By:	Signature
New	All	25/06/2021	Mr. Gawie Bestbier	
01	All	01/08/2023	Mr. Gawie Bestbier	

6 LIST OF EFFECTIVE PAGES

Revision No.:2

Column 1				Column 2			
	PAGE	REVISION	DATED		PAGE	REVISION	DATED
	All	New	25/06/2021				
	All	*2*	*01/08/2023*				

** Indicates page revised, added or deleted by this revision. Column 2 should be completed only when column 1 is full.*

7 LIST OF DEFINITIONS AND ABBREVIATIONS USED IN THIS DOCUMENT

7.1 DEFINITIONS

TERMINOLOGY	DESCRIPTION
ARINC 424	Navigation System Database standard which is an international standard file format for aircraft navigation data.
Environment	Includes Noise, Air Quality, Emissions, etc. Refer to ICAO Doc 9829 (Guidance on the Balanced Approach to Aircraft Noise Management)
Runway Visual Range	RVR is the range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.
Visibility	Visibility for aeronautical purposes is the greater of: • the greatest distance at which a black object of suitable dimensions, situated near the ground, can be seen, and recognized when observed against a bright background. • the greatest distance at which lights in the vicinity of 1 000 candelas can be seen and identified against an unlit background.

7.2 ABBREVIATIONS

ABBREVIATION	MEANING
ACSP	Aeronautical Cartography Service Provider
AMSL	Above Mean Sea Level
ANSP	Air Navigation Service Provider
APV	Approach Procedure with Vertical Guidance
ARINC	Aeronautical Research Incorporated
ATC	Air Traffic Control
ATS	Air Traffic Services
COB	Close of Business
CRC	Cyclic Redundancy Check
FMS	Flight Management System
FPD	Flight Procedure Design
GNSS	Global Navigation Satellite System
GPWS	Ground Proximity Warning System
HRP	Heliport Reference Point
IAF	Initial Approach Fix
ICAO	International Civil Aviation Authority
IDEF0	Integration Definition language 0
IFP	Instrument Flight Procedure
IFR	Instrument Flight Rules
MATF	Missed Approach Turning Fix
MOR	Meteorological Optical Range
MSA	Minimum Sector Altitude

ABBREVIATION	MEANING
NAVAIDS	Navigational Aids
NEMPAA	National Environmental Management Protected Areas Act
OCA	Obstacle Clearance Altitude
OCH	Obstacle Clearance Height
OJT	On the Job Training
PANS-OPS	Procedures for Air Navigation – Operations
PBN	Performance Based Navigation
PDP	Procedure Design Package
PMS	Performance Monitoring System
QNH	Altimeter sub-scale setting to obtain elevation when on the ground
RNAV	Area Navigation
RNP AR	Required Navigation Performance – Authorisation Required
RVR	Runway Visual Range
RWY	Runway
SACAA	South African Civil Aviation Authority
SOP	Standard Operating Procedure
SP	Service Provider
TAA	Terminal Arrival Altitude
TGM	Technical Guidance Material
TrD	Track to Distance
VMC	Visual Maneuvering (Circling)
VSS	Visual Segment Surface

Refer to ICAO Doc 8400 Abbreviations & Codes

8 REFERENCE DOCUMENTS

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

i. ICAO Annexes: 1, 2, 4, 6, 10, 11, 14, 15 and 16 as amended.

ii. ICAO Docs: 4444, 7474, 8168, 8400, 8697, 9365, 9377, 9426, 9501, 9554, 9613, 9674, 9689, 9734, 9735, 9750, 9829, 9849, 9854, 9868, 9869, 9870, 9881, 9882, 9883, 9905, 9906, 9992, 9997, 10031, 10068, 10070 and 10102, 10031, as amended.

iii. ICAO Circulars: 120, 205, 249, 257, 278, 301, 303, 305, 317, 319, 321, 324 and 330 as amended.

iv. SA CAR and CATS Part 139, 173, 177 and 187 as amended.

v. IAIP.

vi. National Environmental Management: Protected Areas Act 57 of 2003.

9 TGM GENERAL

9.1 DIFFERENCES FROM ICAO STANDARDS, RECOMMENDED PRACTICES AND PROCEDURES

9.1.1 Minimum Sector Altitudes (MSA)/Terminal Arrival Altitudes (TAA)

a) Construction of visual and instrument flight procedures.

b) Minimum sector altitudes shall be established for each aerodrome where instrument approach procedures have been established. Each minimum sector altitude shall be calculated by:

i. taking the highest elevation in the sector concerned.

ii. adding a clearance of at least:

a. 450m (1500FT) for a minimum sector altitude based on a radio navigation aid, or

b. 300m (1000FT) for a minimum sector altitude based on a significant point, the aerodrome reference point (ARP) or the heliport reference point (HRP) (commonly referred to as an "RNAV MSA").

c) rounding the resulting value up to the next higher 100FT increment, as appropriate.

10 ENVIRONMENTAL MANAGEMENT AND REQUIREMENTS

10.1 Flight procedures should be designed to consider the requirements as specified in the National Environmental Management: Protected Areas Act, 2003.

10.2 ICAO requires that the environmental aspect must be considered in the design of flight procedures. These requirements are contained in the following relevant documents but are not limited to.

a) ICAO Doc 8168 Vol 2 (Construction of Visual and Instrument Flight Procedures),

b) ICAO Doc 9906 Vol 1 (Flight Procedure Design Quality Assurance System)

c) Annex 16 – Environmental protection

d) Doc 9829 – Aircraft noise

e) Doc 9888 – Noise abatement procedures

11 QUALITY ASSURANCE OVERVIEW

Refer to ICAO Doc 9906

12 STRUCTURED PDP

Reference to Appendix A

The Procedure Design Package should be submitted in a chronological, organized manner and should be structured as follows.

13 AIP PUBLICATION DOCUMENTS

13.1 Draft Instrument Approach Chart

13.2 Tabulation Chart

13.3 Textural Description

14 DESIGN FILE

14.1 DGN

14.2 DWG

14.3 AIXM (Should it be requested)

15 REPORT

15.1 Designer Information and signature

15.2 Verifier Information and signature

15.3 Chief Designer Information and signature

15.4 Comprehensive Design Report including all supporting documentation

15.5 Verification Report

16 SOURCE DOCUMENTATION

16.1 SACAA SWOT Data

16.2 Survey Data

16.3 SRTM, DTMS, DEMs (if applicable)

17 SUPPORT DOCUMENTATION

17.1 All Computations (MSD, TrD, CCO, CDO etc.)

17.2 Automated Design Report

17.3 TrD, Shortest distance and increased gradient calculations

17.4 Missed Approach Increased climb gradient calculations and depictions

17.5 NEMPAA Letter of exemption (if applicable)

17.6 Letter of agreement / consent for any airspace infringements

17.7 All other relevant communications

18 URS

18.1 Signed URS

18.2 Proof of user consultation and other related communications

18.3 e.g., NEMPAA Exemption, Infringed Airspace Agreement

19 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 9.5.1: Conversion Factors

From	To	Factor
Feet (FT)	Metre (M)	x 0.3048

Table 9.5.1: Conversion Factors		
Feet (FT)	Nautical Mile (nm)	÷ 6076
Metre (M)	Feet (FT)	÷ 0.3048
Metre (M)	Nautical Mile (nm)	÷ 1852
Nautical Mile (nm)	Feet (FT)	x 6076
Nautical Mile (nm)	Metre (M)	x 1852

20 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.

21 USE OF VARIOUS NAVIGATION SYSTEMS

21.1 Before designing procedures requiring the switching between navigation systems (e.g., 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.

21.2 When designing a procedure were switching between navigation systems cannot be avoided, (e.g., an RNP-APCH onto an ILS), reverting to the original navigation system (RNP-APCH) should be avoided.

Example:

The Missed Approach of the ILS would be used to the Missed Approach termination point.

The above requirement also applies to Communication Failure Procedures.

22 PROCEDURE RESTRICTIONS

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

22.2 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 to Annex C).

23 REFERENCE DATUM HEIGHT (RDH)

23.1 RDH values and recommended ranges of values appropriate for aircraft categories A to D.

23.2 RNP AR procedures serving the same runway should share common RDH and GP angle values. If an ILS serves the runway, the ILS RDH and GP angle values should be used to define the VPA. If there is no ILS, but a visual glide slope indicator (VGSI) system with a suitable RDH and GP angle serves the runway, the VGSI RDH and VPA equal to the GP angle should be used.

23.3 Otherwise, an appropriate RDH value from Table 4-4 should be selected, with a 3° VPA.

24 CALCULATION OF DME SLANT RANGE

The calculations have to be included in the PDP.

25 OBSTACLE CLEARANCE ALTITUDE/HEIGHT (OCA/H)

25.1 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.

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

25.2.1 The calculated OCA/H as contained in the Procedure Design Report, or

25.2.2 System Minima, or

25.2.3 State Minima, whichever is higher.

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

25.3.1 2D RNAV: LNAV

25.3.2 APV (BaroVNAV): LNAV/VNAV

25.3.3 APV (SBAS): LPV

25.3.4 GBAS: GLS

26 MINIMUM ALTITUDE: HOLDING/RACETRACK PATTERNS

The Minimum Altitude to be used for the construction of a Holding Pattern is the highest MSA value rounded up to the nearest 500FT.

27 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 9.13.1: Minimum Horizontal & Vertical Tolerances

Data Source	Horizontal Tolerance	Vertical Tolerance	Vegetation Tolerance
Survey Data (with WGS84 Integrity Report)	MNM OBST Extent	0m	As deemed necessary
Survey Data (without WGS84 Integrity Report)	MNM OBST Extent	3m	As deemed necessary
SRTM Terrain Data	25m	10m	10m
SACAA Obstacle Data	300m*	30m*	As deemed necessary
CD: NGI Terrain Data	25m	5m	10m
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.

* – Unless otherwise defined.

28 MINIMUM OBSTACLE CLEARANCE

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

Table 9.14.1: Minimum Obstacle Clearance

Segment	MOC	MOCA
ATC Surveillance Minimum Altitude Chart	300m (1000FT)	Rounded up to nearest 100FT (500FT recommended)
MSA (Conventional)	450m (1500FT)	Rounded up to nearest 100FT (500FT Recommended)
TAA/MSA (RNAV)	300m (1000FT)	Rounded up to nearest 100FT (500FT Recommended)

28.2 ATC Surveillance Minimum Altitude Chart:

28.2.1 Definition

An ATC SMAC is defined as a 50NM assessed area around the aerodrome of interest, that provides safe vectoring altitudes for IFR traffic.

28.2.2 Purpose

a) To provide safe vectoring altitudes to ATC around the vicinity of the aerodrome up to 50NM.

b) To provide pilots with an indication of the levels ATC will descend the aircraft to.

28.2.3 Design Considerations

a) All obstacle data.

b) NEMPAA, Danger, Prohibited and Restricted areas.

28.2.4 Criteria

a) The terrain clearance chart shall be designed between 0 – 50 NM referenced from the AD VOR.

b) The minimum altitude vectoring is split into two, the region between 0 – 20NM and 20 – 50 NM from the radar antenna.

28.2.5 Sectors

a) Sectors within 0 – 20 NM of the radar antenna will be assessed with a MOC of 300m (1000 ft) and a buffer of 3 NM

b) Sectors within 20 – 50 NM of the radar antenna will be assessed with a MOC of 300m (1000 ft) and a buffer of 5 NM

c) Sectors that fall in both regions will be assessed as follows:

- Portions falling with 0 – 20 NM will be assessed as per 28.2.5 (a).
- Portions falling with 20 – 50 NM will be assessed as per 28.2.5 (b).

- The assessment results will then be combined where deemed necessary.

d) Adjacent sectors resulting in the same MOCA shall be combined unless stipulated otherwise by the end user.

e) Where there are two or more radar antennae within the 50NM area, the antennae can be optimized to use a 3NM buffer as far as possible.

29 PROCEDURE CONTAINMENT

29.1 For procedures within controlled airspace, the protection areas of the procedure(s) shall 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.

29.2 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.

30 WAYPOINT NAMING PROTOCOL

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

30.2 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.

30.3 In order to conform to ARINC 424 specifications, which standardizes 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.

31 RNAV

31.1 Instrument Approach / STAR / SID Procedures

31.1.1 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, etc).

31.1.2 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 runway designator with the lowest numerical value 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 9.16.4: Waypoint Naming Protocol for RNAV Instrument Approach Procedures below.

D Fix Type Number as listed in Table 9.16.4: 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.

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, MAPT:	*WK3MP (Prior to the MAPT)*
Waterkloof, RWY 19, MAPT:	*RW19*
Lanseria, RWY 24R, MATF 3:	*LA4M3*

i. 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:	*JS361, JS362, JS363…*
Lanseria:	*LA361, LA362, LA363…*
Waterkloof:	*WK361, WK362, WK363*

ii. Since 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.

iii. 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 OR1F1, WK362, LA3636 to NESAN*
Lanseria SID:	*Route LA363, WK3N1, OR364, LA367 to NESAN*

Table 9.16.4: Waypoint Naming Protocol for RNAV Instrument Approach Procedures

Fix Type	Fix Type Identifier	Fix Type Number
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	5LNC	Not Applicable
Initial Approach Fix (IAF) where no 5LNC has been assigned	N	*Sequential Numbering
Intermediate Approach Fix (IF)	T	Sequential Numbering

Table 9.16.4: Waypoint Naming Protocol for RNAV Instrument Approach Procedures		
Fix Type	Fix Type Identifier	Fix Type Number
Final Approach Fix (FAF)	F	Sequential Numbering
Missed Approach Point (MAPT)	M	MP
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	M	Sequential Numbering
SID DER/Fictitious Waypoint	D	R

* 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).

32 VISUAL MANOEUVRING (CIRCLING) REQUIREMENTS

32.1 In South Africa Visual Maneuvering (Circling) procedures are known as "Cloudbreak"/"Breakcloud" procedures.

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

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

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

32.2.3 Such procedure is conducted inside controlled airspace.

32.2.4 Such procedure is conducted outside controlled airspace.

32.2.5 Real-time local QNH may not be available.

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

33 PROCEDURE SUBMISSION

33.1 PDPs can be submitted to the SACAA, PD&C office as follows.

33.1.1 Use file compression software and email the compressed folder.

33.1.2 Upload the PDP to a cloud storage service, like Google Drive, Dropbox, or OneDrive, and share or email the link.

Relevant email addresses are published on the SACAA Webpage.

34 SACAA VALIDATION AND APPROVAL

34.1 Design Approval

34.1.1 All procedures shall be submitted to the SACAA in accordance with SACARS-173, SACATS-FPD and this TGM.

35 VERIFICATION PROCESS

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, SACARS-173, SACATS-FPD and this TGM.

36 GROUND VALIDATION OBJECTIVES

Refer to ICAO Doc 9906

This Part of the TGM 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.

37 GROUND VALIDATION

37.1 The Ground Validation activity as outlined in Annex B, will commence upon receipt of a "Procedure Design Package (PDP)". The structure and content of the PDP is described in Annex – A.

37.2 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.

37.3 Incomplete PDP's shall be returned to the applicant showing elements of the PDP that are incomplete.

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

37.4.1 Check if the design is based on a declared obstacle, aerodrome, and Navaid data set.

37.4.2 The design is based on a declared ICAO PANS-OPS DOC 8168 Vol II version.

37.4.3 That obstacle data accuracy is declared and where appropriate, conform to ICAO Annex-15 data accuracy and integrity requirements.

37.4.4 Ensure that all procedure tracks have appropriate associated protection areas.

37.4.5 Where appropriate, procedures are accompanied by communication failure procedures.

37.4.6 Calculations can be tracked and verified.

37.4.7 Where designs do not conform to ICAO DOC 8168 criteria, these designs must have been agreed with the SACAA or should be accompanied by a Safety Case.

37.4.8 Provide evidence of obstacle clearance.

37.4.9 Provide evidence that stakeholders have been consulted with.

37.4.10 Check that the procedure is safe.

37.4.11 For all PBN procedures, check the correctness of Path Terminators used.

37.4.12 Review pertinent flight inspection reports.

37.4.13 Check if the applicable navigation systems support the intended instrument procedure. Check NAVAIDS, GNSS availability and assess if flight inspection is required.

37.4.14 Determine if Flight Validation is required.

38 FLIGHT VALIDATION

38.1 Annex C provides guidance as to when Flight Simulation, Flight Validation and Night Flight Validation is required.

38.2 Flight validation should not be confused with flight inspection. Flight inspection of instrument flight procedures is

required to assure that the appropriate navigation system supports the procedure whereas the purpose of conducting Flight Validation of instrument flight procedures is to ensure safety, procedure data integrity and fly ability.

38.3 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.

38.4 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 numerous factors. ICAO provide guidance as to when a Flight Validation is required, and they are:

38.4.1 New procedures where there are no published procedures to the same runway.

38.4.2 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.)

38.4.3 When accuracy/integrity of data used in the IFP design and/or the Aerodrome environment is not assured.

38.4.4 This list is not all inclusive but provides some guidance as to when Flight Validation will be required.

39 FLIGHT VALIDATION OBJECTIVES

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

39.1.1 Conduct an assessment of fly ability to determine that the procedure can be safely flown.

39.1.2 Provide the final assurance that adequate obstacle clearance has been provided.

39.1.3 Verify that the navigation data to be published is correct.

39.1.4 Verify that all required infrastructure, such as runway markings, lighting, and communications and navigation sources are in place and operative.

39.1.5 Ensure the documentation of navigation systems confirms the applicable navigation system(s) (NAVAID, GNSS, RADAR, etc.) supports the procedure.

39.1.6 Evaluate other operation factors, such as charting, required infrastructure, visibility, intended aircraft category, etc.

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

40 PRE-FLIGHT VALIDATION

Refer to ICAO Doc 9906

41 FLIGHT SIMULATION

Refer to ICAO Doc 9906

42 DATA VERIFICATION

Refer to ICAO Doc 9906

43 OBSTACLE ASSESSMENT

43.1 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.

43.2 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.

44 FLYABILITY AND HUMAN FACTORS

44.1 Objectives

44.2 Evaluate aircraft Maneuvering areas for safe operations for each category of aircraft for which the procedure is intended.

44.3 Review the fly ability of the instrument procedure as per ICAO DOC 9906 Vol 5.

45 PROCEDURES

Refer to ICAO Doc 9906

46 ASSOCIATED VALIDATION TASKS

Refer to ICAO Doc 9906

46.1 The following associated flight validation tasks may be performed in conjunction with the obstacle or fly ability assessment as required.

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

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

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

46.1.4 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.

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

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

46.1.7 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.

46.1.8 Evaluate the light system for:

a) Correct light pattern as charted.

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

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

47 IAC DEPICTION AND DETAILS

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

48 POST FLIGHT ANALYSIS AND DOCUMENTATION

48.1 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:

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

48.1.2 Operational mitigations are documented.

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

48.1.4 Recorded data is processed and made available for archiving.

49 DESIGN MAINTENANCE

49.1 All procedures shall be revised and maintained in accordance with ICAO design criteria, SACARS-173, SACATS-FPD.

50 CARTOGRAPHY

50.1 Differences from ICAO standards, recommended practices and procedures

50.1.1 GEN 1.7 Differences from ICAO Standards, Recommended Practices and Procedures A list of significant differences between national regulations and practices of the State and related ICAO provisions, including:

a) provision affected (Annex as amended, paragraph); and

b) difference in full text.

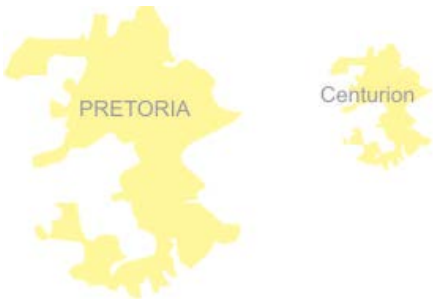
51 STANDARDS

51.1 Colours

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

Note: The specified CMYK numbering / spectrum are SACAA guidelines

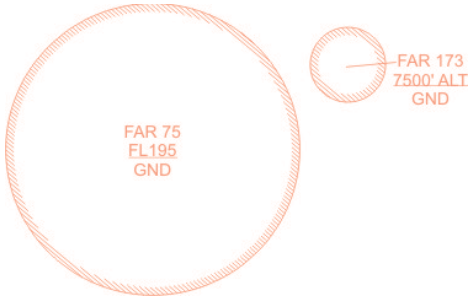
51.2 Build-up Areas

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	

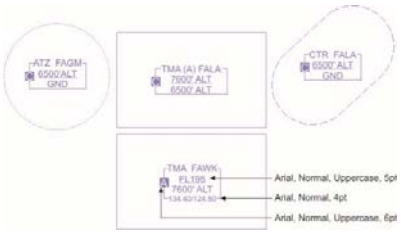
51.3 Hydrography

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	

51.4 Restricted, Prohibited and Danger Areas

Area Outline: 0.05mm Hatching: 0.05mm and to be obtained from 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	

51.5 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	

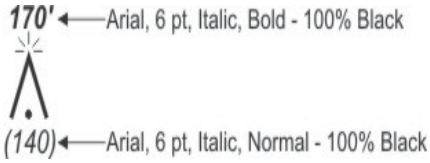
51.6 Spot Height

.3000 ← Arial, 6 pt, Normal, Bold - 100% Black

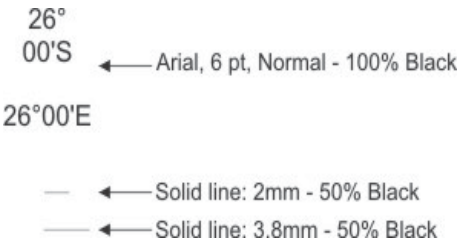
•73 ← Arial, 8 & 6 pt, Normal, Bold - 100% Black

.6397 ← Arial, 4 pt, Normal - 100% Black

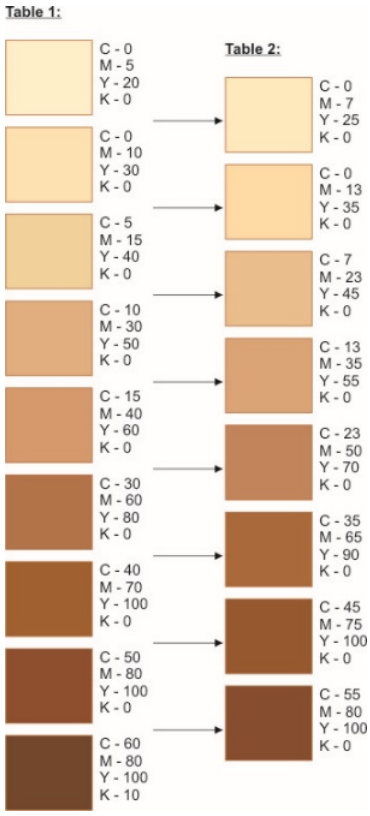
51.7 Obstacles



51.8 Latitude and Longitude

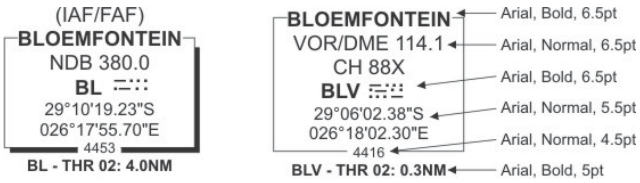


51.9 Topography

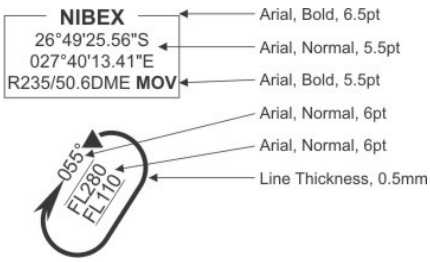
Area Outline: 0.01mm Outline Colour: C – 30, M – 60, Y – 80, K – 0 Fill: As depicted in the example below Labelling Font Size - Contours: Arial, 3pt Labelling Colour: C – 30, M – 60, Y – 80, K – 0	

51.10 10nm Distance Circle

51.11 Navigation Aid Information Block



51.12 Reporting Waypoint: Holding and Information Block



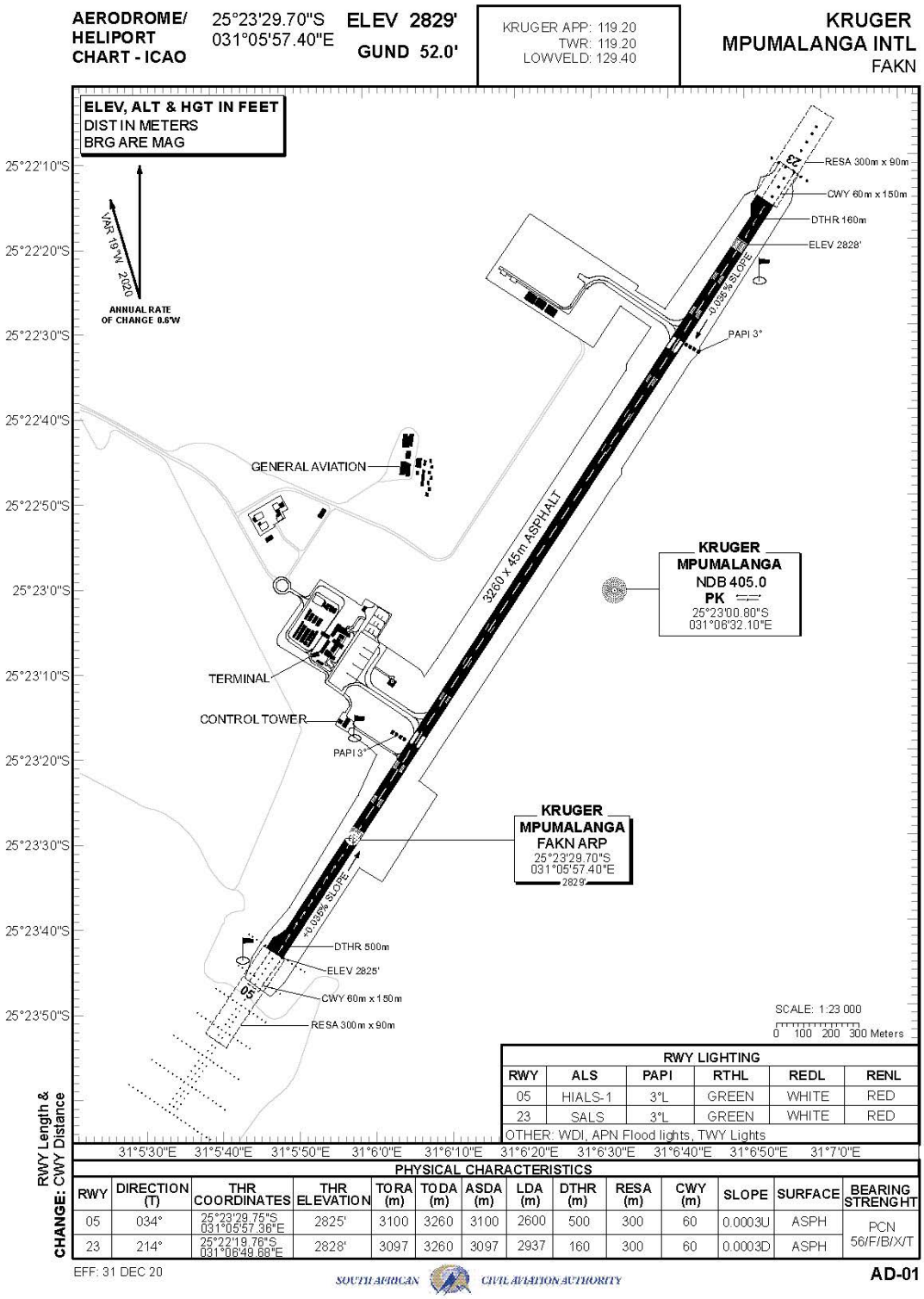
51.13 National Parks/Protection Areas

Fill: C – 7, M – 0, Y – 29, K – 0 Area Outline: 0.02mm Outline Colour: C – 41, M – 17, Y – 72, K – 0 Labeling Colour: C – 41, M – 17, Y – 72, K – 0 Labeling Font Size: Rivers: Arial, Upper-and lowercase, 3pt – 3.5pt Dams: Arial, Upper-and lowercase, 3pt – 3.5pt Shore lines: Arial, Uppercase, 3.5pt	

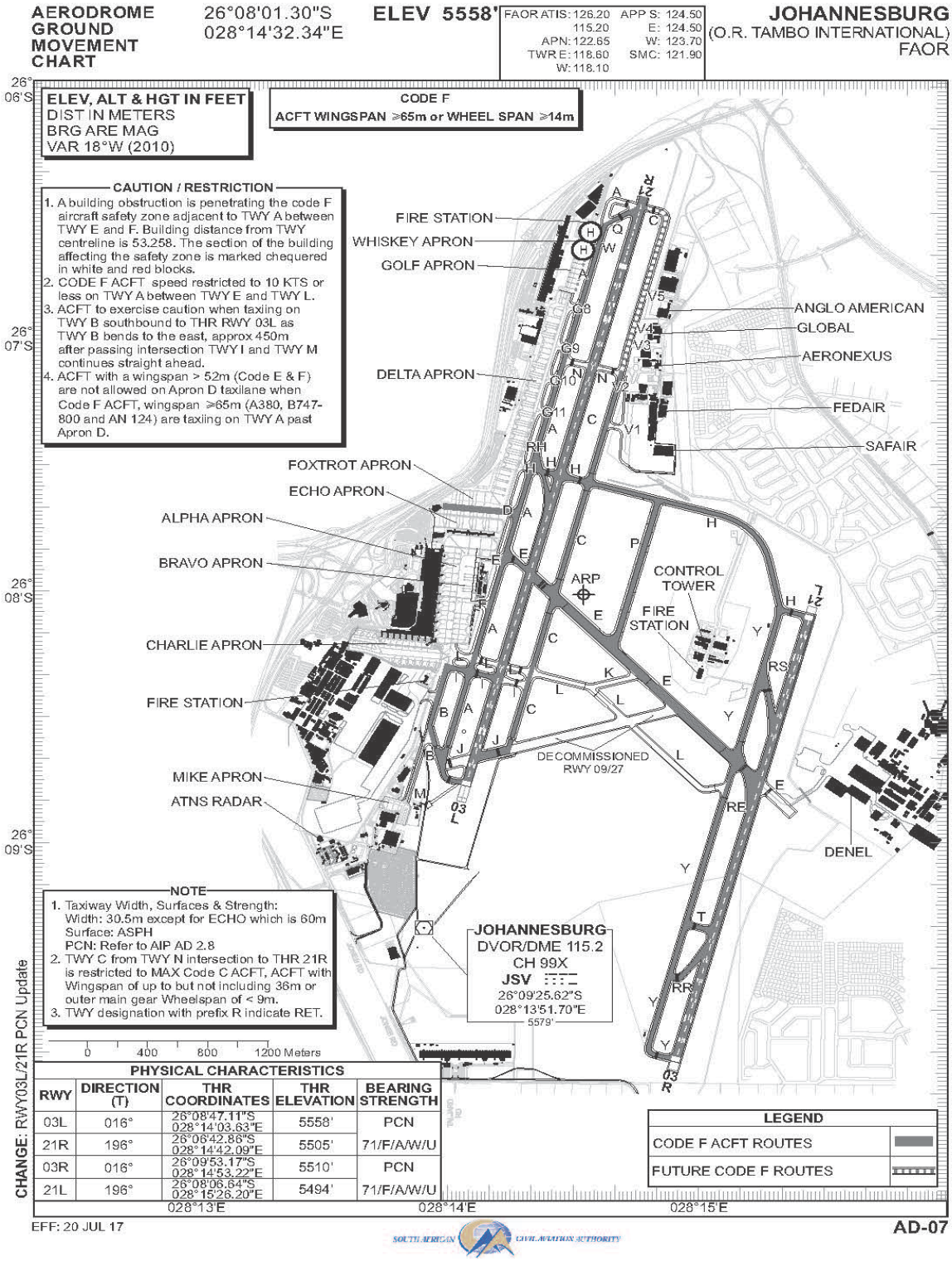
52 CHART EXAMPLES

Enclosed are the current published Aeronautical Charts for reference purposes. All published IACs are in the AIP and on the SACAA Webpage.

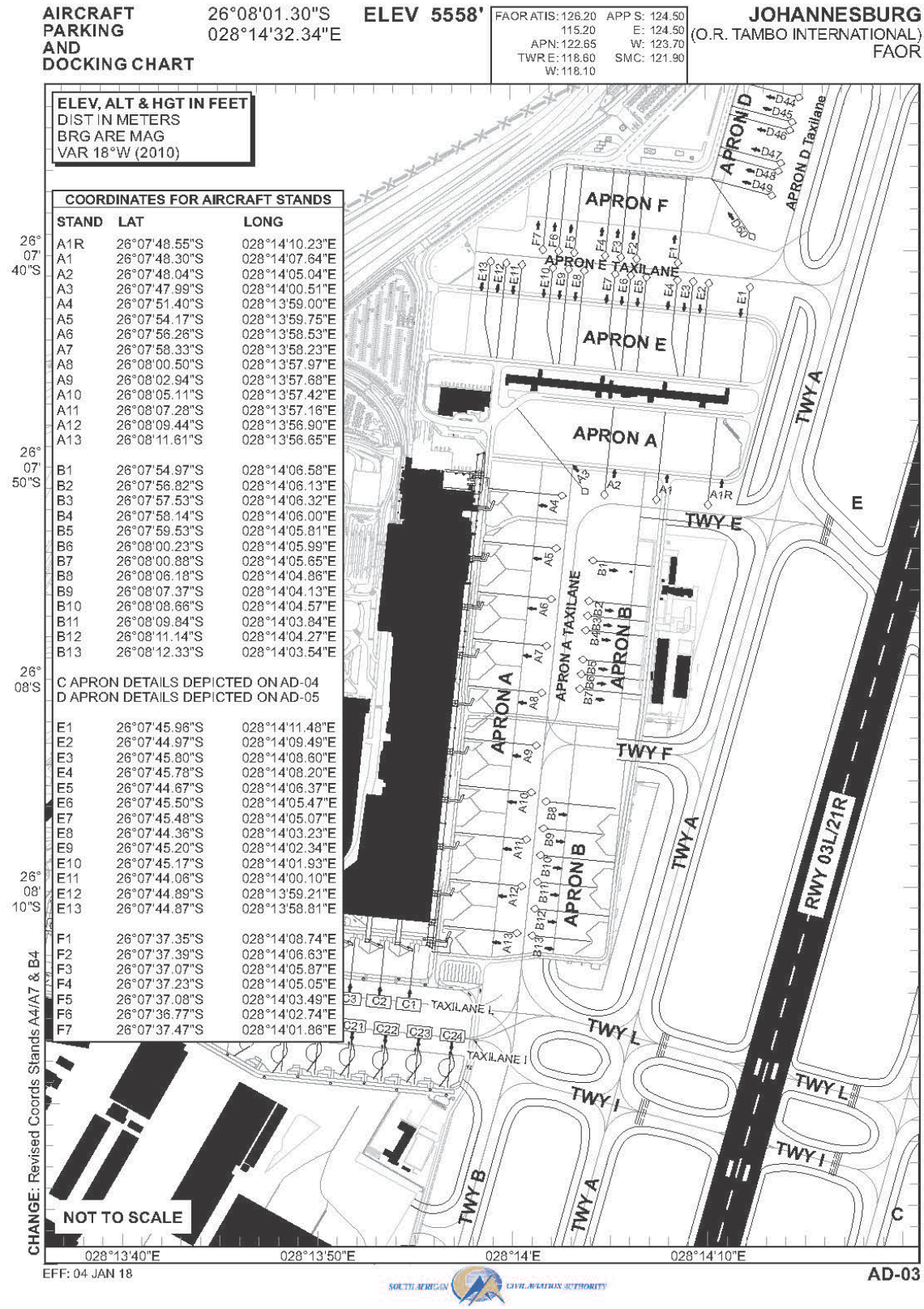
a) Aerodrome Chart



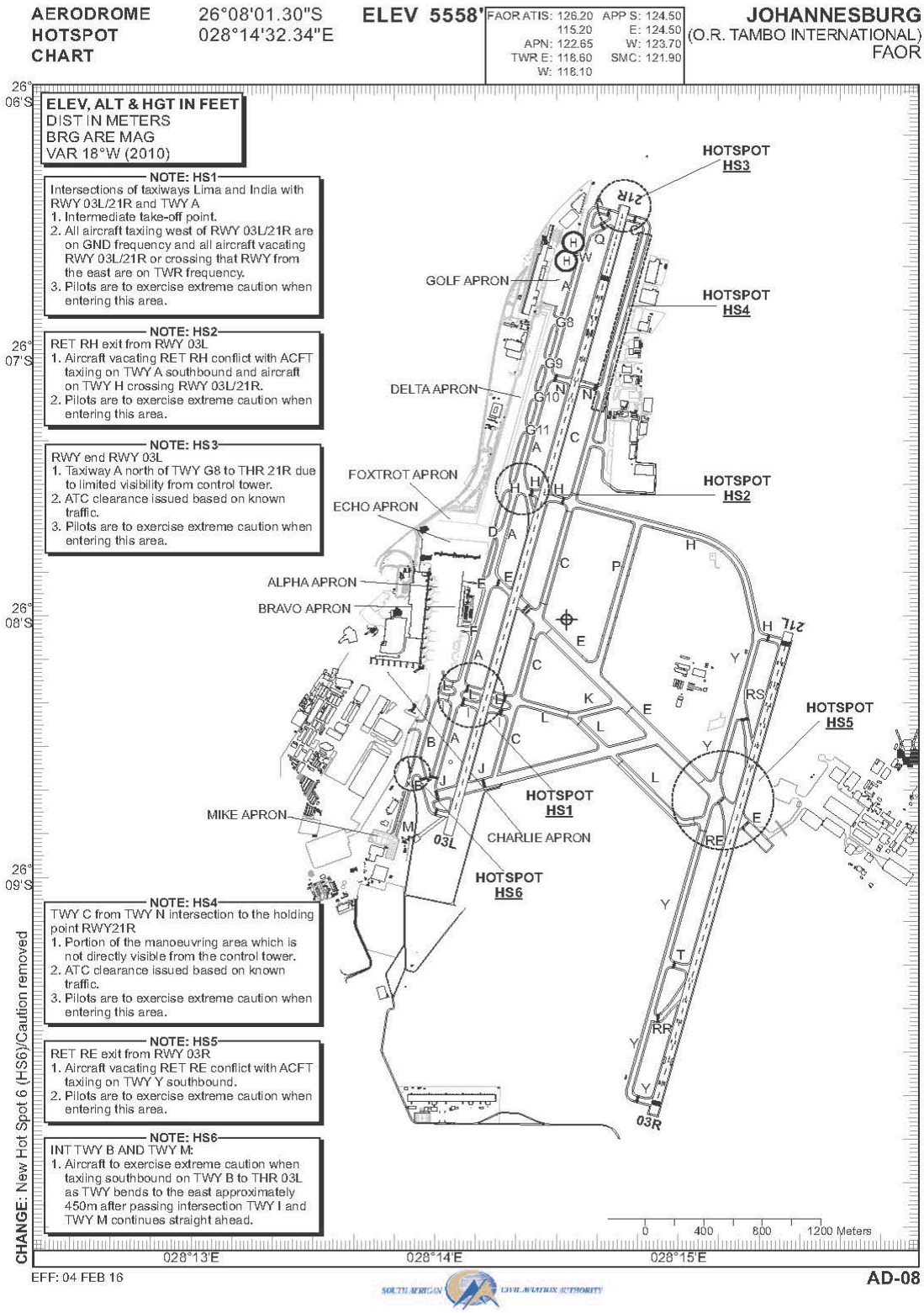
b) Ground Movement Chart



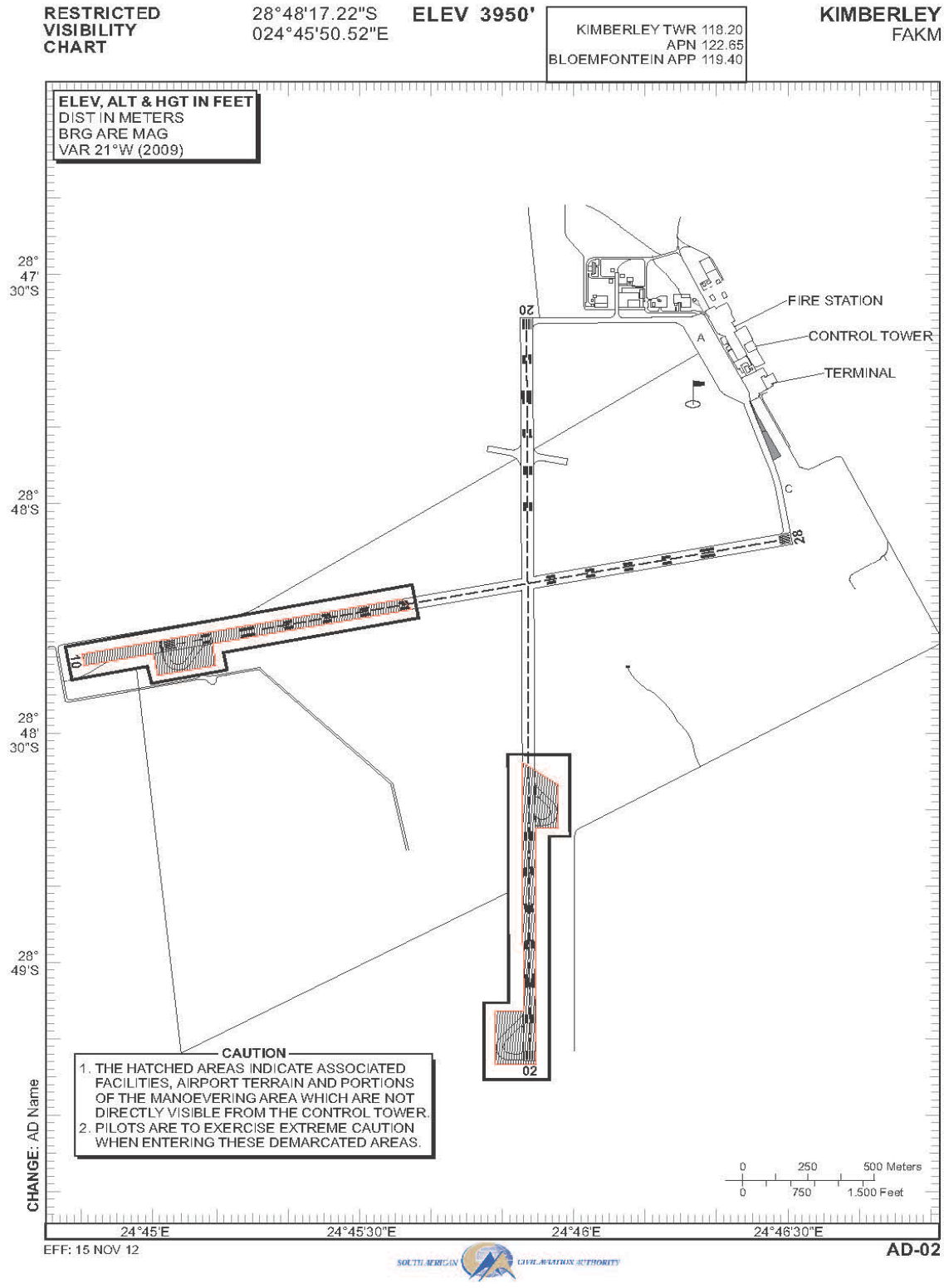
c) Parking and Docking Chart



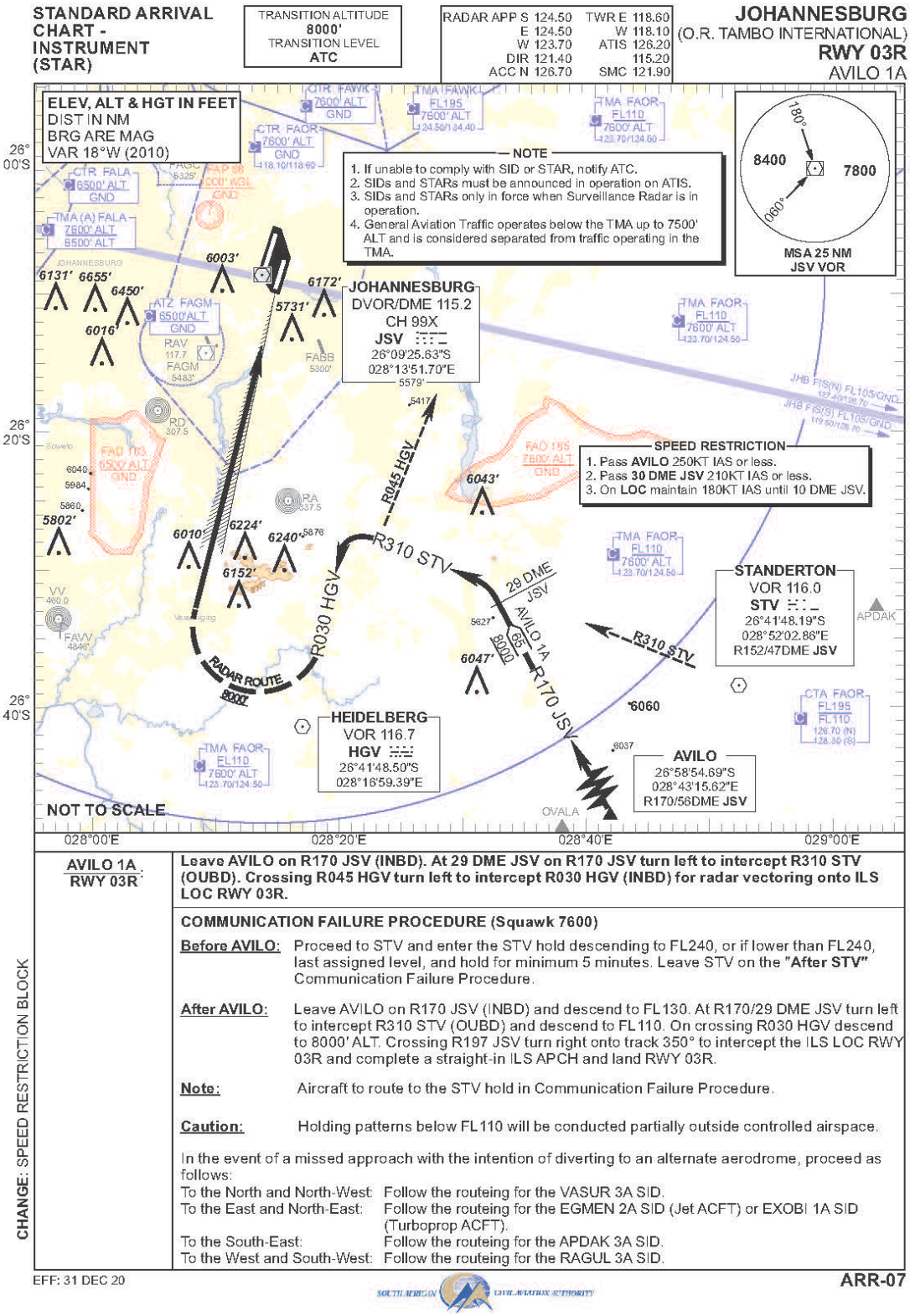
d) Aerodrome Hot Spot Chart



e) Restricted Visibility Chart



f) Standard Terminal Arrival Chart



AVILO 1A RWY 03R

Leave AVILO on R170 JSV (INBD). At 29 DME JSV on R170 JSV turn left to intercept R310 STV (OUBD). Crossing R045 HGV turn left to intercept R030 HGV (INBD) for radar vectoring onto ILS LOC RWY 03R.

COMMUNICATION FAILURE PROCEDURE (Squawk 7600)

Before AVILO: Proceed to STV and enter the STV hold descending to FL240, or if lower than FL240, last assigned level, and hold for minimum 5 minutes. Leave STV on the **"After STV"** Communication Failure Procedure.

After AVILO: Leave AVILO on R170 JSV (INBD) and descend to FL130. At R170/29 DME JSV turn left to intercept R310 STV (OUBD) and descend to FL110. On crossing R030 HGV descend to 8000' ALT. Crossing R197 JSV turn right onto track 350° to intercept the ILS LOC RWY 03R and complete a straight-in ILS APCH and land RWY 03R.

Note: Aircraft to route to the STV hold in Communication Failure Procedure.

Caution: Holding patterns below FL110 will be conducted partially outside controlled airspace.

In the event of a missed approach with the intention of diverting to an alternate aerodrome, proceed as follows:

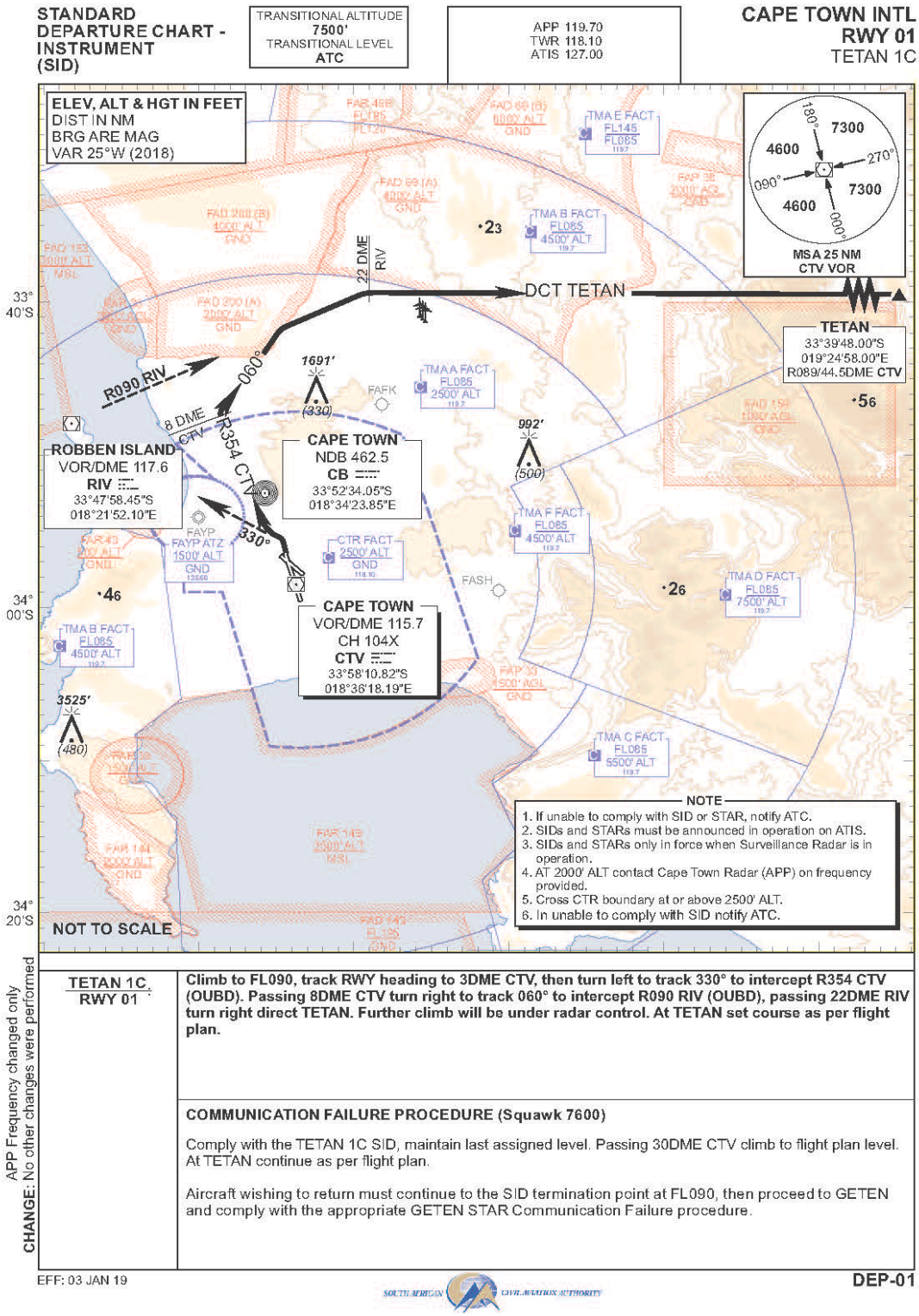
To the North and North-West: Follow the routeing for the VASUR 3A SID.
To the East and North-East: Follow the routeing for the EGMEN 2A SID (Jet ACFT) or EXOBI 1A SID (Turboprop ACFT).
To the South-East: Follow the routeing for the APDAK 3A SID.
To the West and South-West: Follow the routeing for the RAGUL 3A SID.

CHANGE: SPEED RESTRICTION BLOCK

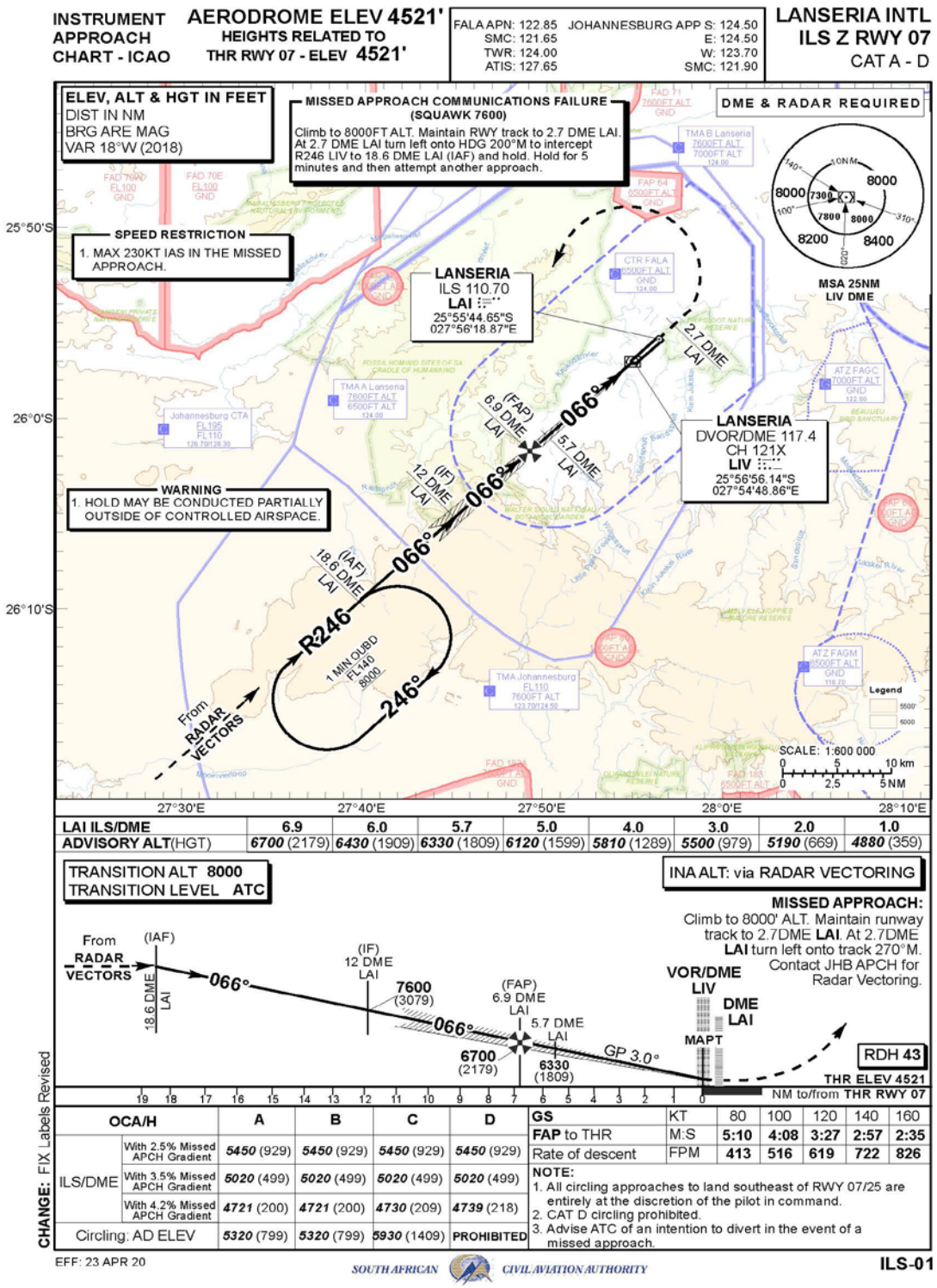
EFF: 31 DEC 20

ARR-07

g) Standard Instrument Departure Chart



h) Instrument Approach Chart (Precision Approach)



i) Instrument Approach (Precision Approach) Data Tabulation Chart

AERONAUTICAL DATA TABULATION

LANSERIA INTL
ILS Z RWY 07
CAT A-D

ILS APPROACH TO FALA RWY 07					
Fix/Waypoint	**Type**	**Latitude**	**Longitude**	**Bearing ° (M)**	**Distance**
18.6 DME LAI	IAF	26°09'18.9200"S	027°39'44.4700"E	-	18.6 DME
12 DME LAI	IF	26°04'52.4400"S	027°45'10.9100"E	066°	12 DME
6.9 DME LAI	FAP	26°01'24.7300"S	027°49'24.9000"E	066°	6.9 DME
5.7 DME/LAI	-	-	-	-	-
LIV	VOR/DME	25°56'56.1400"S	027°54'48.8600"E	-	-
ILS LAI	GP	25°55'44.6500"S	027°56'18.8700"E	066°	5.7 DME
18.6 DME LAI	MAHF	26°09'18.9200"S	027°39'44.4700"E	R 246	18.6 DME

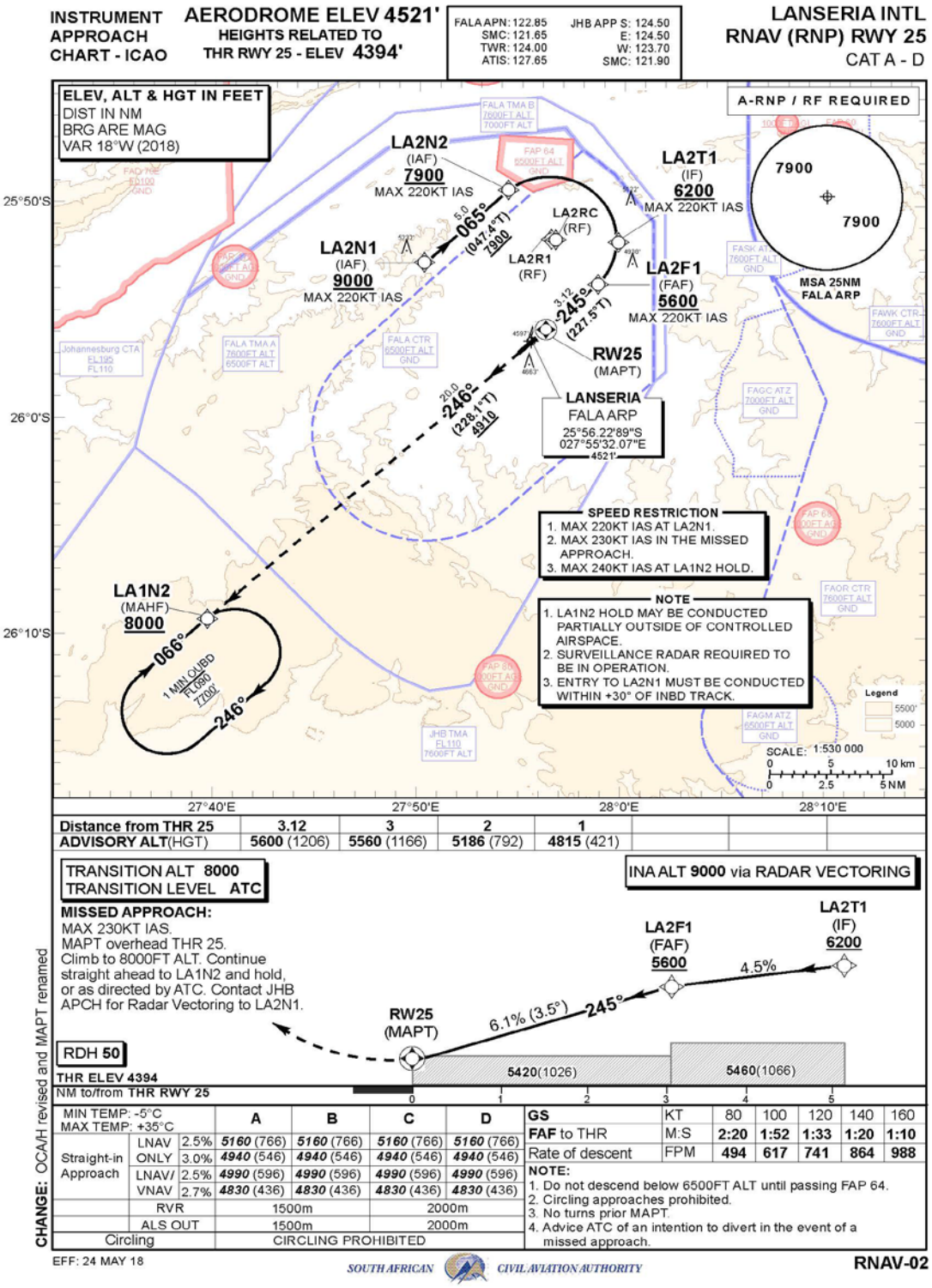
CHANGE: FIX/WYPT Column revised

EFF: 23 APR 20

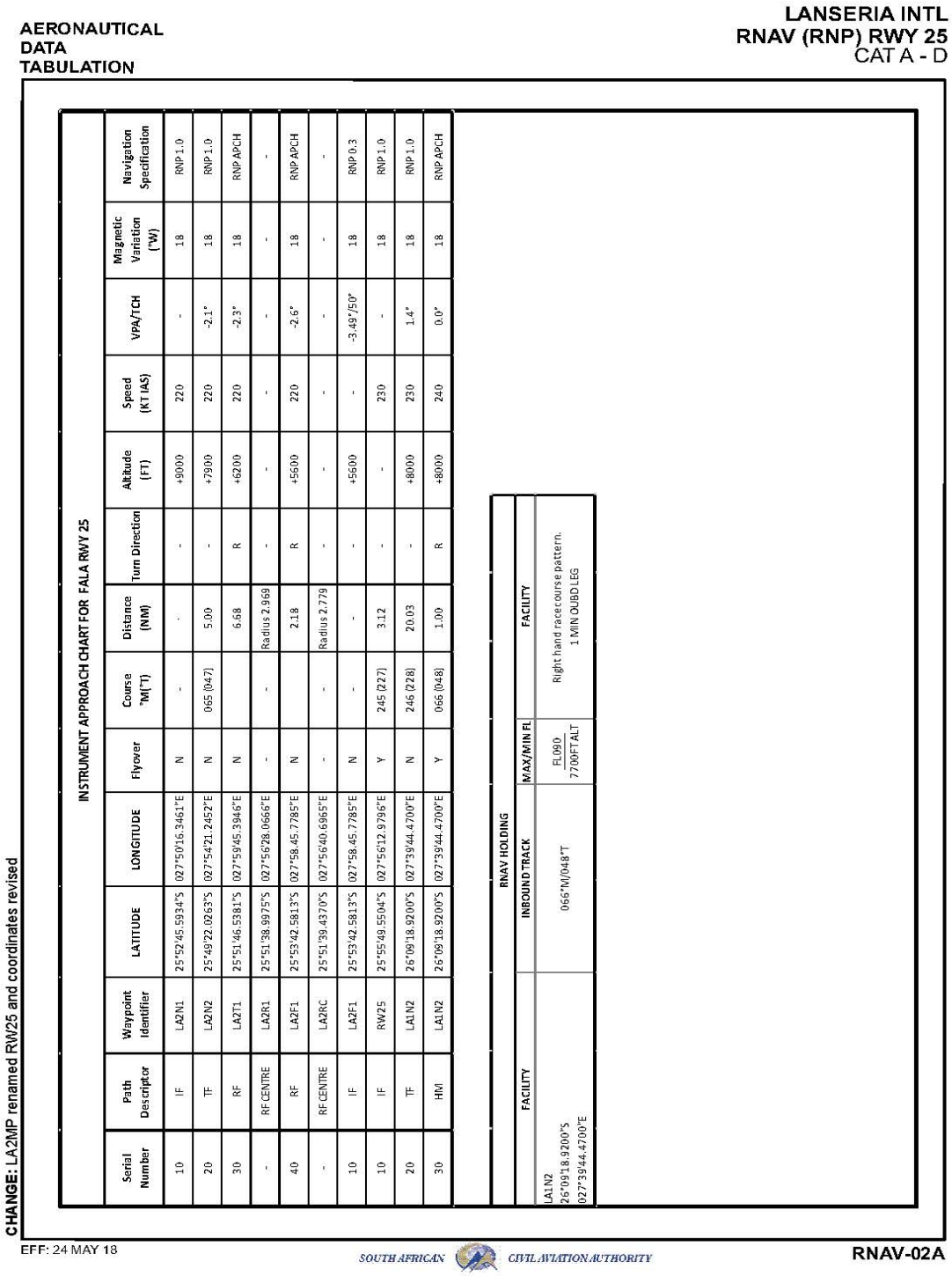
SOUTH AFRICAN CIVIL AVIATION AUTHORITY

ILS-01A

j) Instrument Approach Chart (RNAV (RNP))



k) Instrument Approach (RNAV (RNP)) Data Tabulation Chart



AERONAUTICAL DATA TABULATION

LANSERIA INTL
RNAV (RNP) RWY 25
CAT A - D

CHANGE: LA2MP renamed RW25 and coordinates revised

INSTRUMENT APPROACH CHART FOR FALA RWY 25

Serial Number	Path Descriptor	Waypoint Identifier	LATITUDE	LONGITUDE	Flyover	Course °M(°T)	Distance (NM)	Turn Direction	Altitude (FT)	Speed (KT IAS)	VPA/TCH	Magnetic Variation (°W)	Navigation Specification
10	IF	LA2N1	25°52'45.5934"S	027°50'16.3461"E	N	-	-	-	+9000	220	-	18	RNP 1.0
20	TF	LA2N2	25°49'22.0263"S	027°54'21.2452"E	N	065 (047)	5.00	-	+7900	220	-2.1°	18	RNP 1.0
30	RF	LA2T1	25°51'46.5381"S	027°59'45.3946"E	N		6.68	R	+6200	220	-2.3°	18	RNP APCH
-	RF CENTRE	LA2R1	25°51'38.9975"S	027°56'28.0666"E	-	-	Radius 2.969	-	-	-	-	-	-
40	RF	LA2F1	25°53'42.5813"S	027°58.45.7785"E	N		2.18	R	+5600	220	-2.6°	18	RNP APCH
-	RF CENTRE	LA2RC	25°51'39.4370"S	027°56'40.6965"E	-	-	Radius 2.779	-	-	-	-	-	-
10	IF	LA2F1	25°53'42.5813"S	027°58.45.7785"E	N	-	-	-	+5600	-	-3.49°/50'	18	RNP 0.3
10	IF	RW25	25°55'49.5504"S	027°56'12.9796"E	Y	245 (227)	3.12	-	-	230	-	18	RNP 1.0
20	TF	LA1N2	26°09'18.9200"S	027°39'44.4700"E	N	246 (228)	20.03	-	+8000	230	1.4°	18	RNP 1.0
30	HM	LA1N2	26°09'18.9200"S	027°39'44.4700"E	Y	066 (048)	1.00	R	+8000	240	0.0°	18	RNP APCH

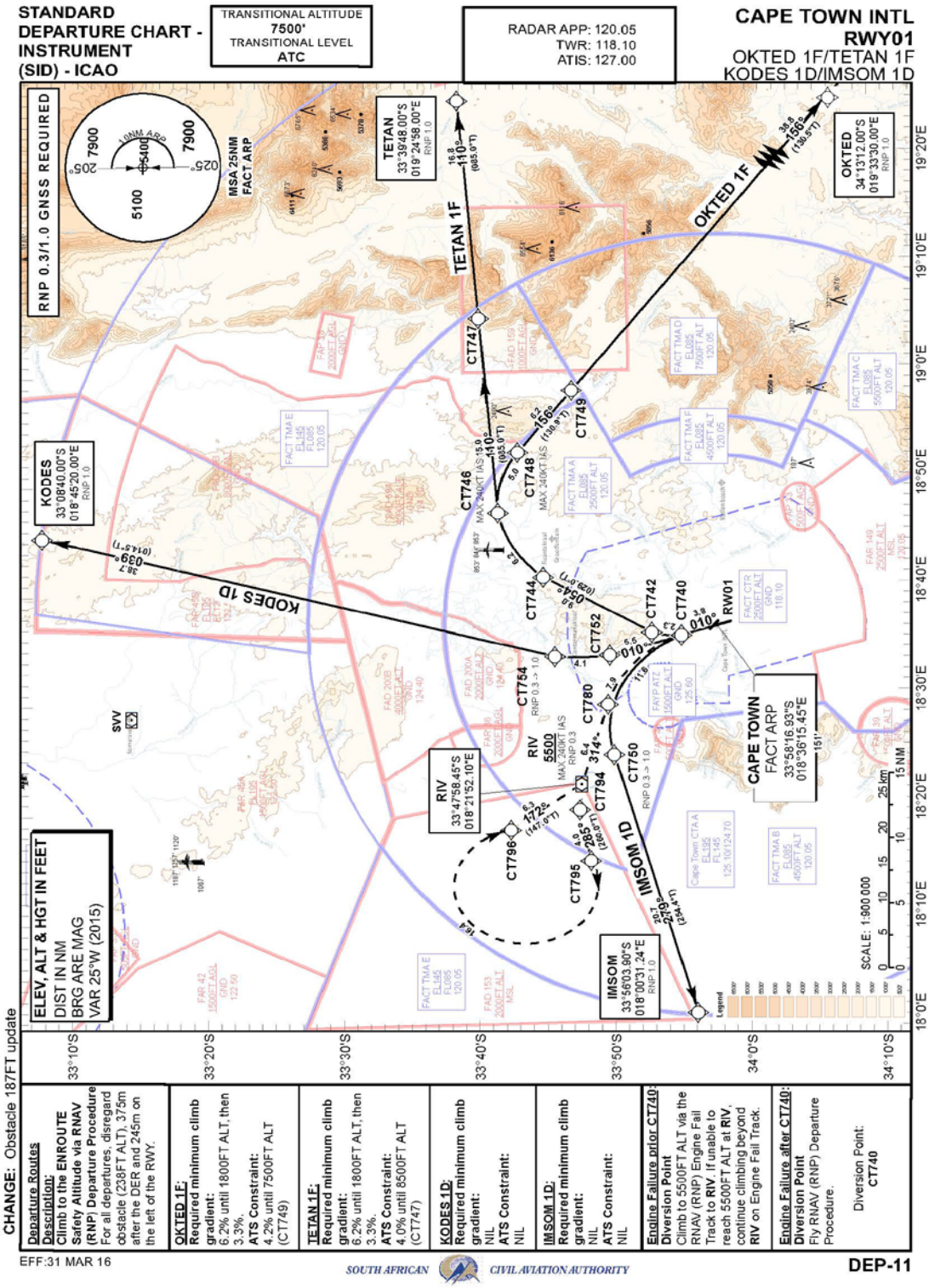
RNAV HOLDING			
FACILITY	INBOUND TRACK	MAX/MIN FL	FACILITY
LA1N2 26°09'18.9200"S 027°39'44.4700"E	066°M/048°T	FL090 7700FT ALT	Right hand racecourse pattern. 1 MIN OUBD LEG

EFF: 24 MAY 18

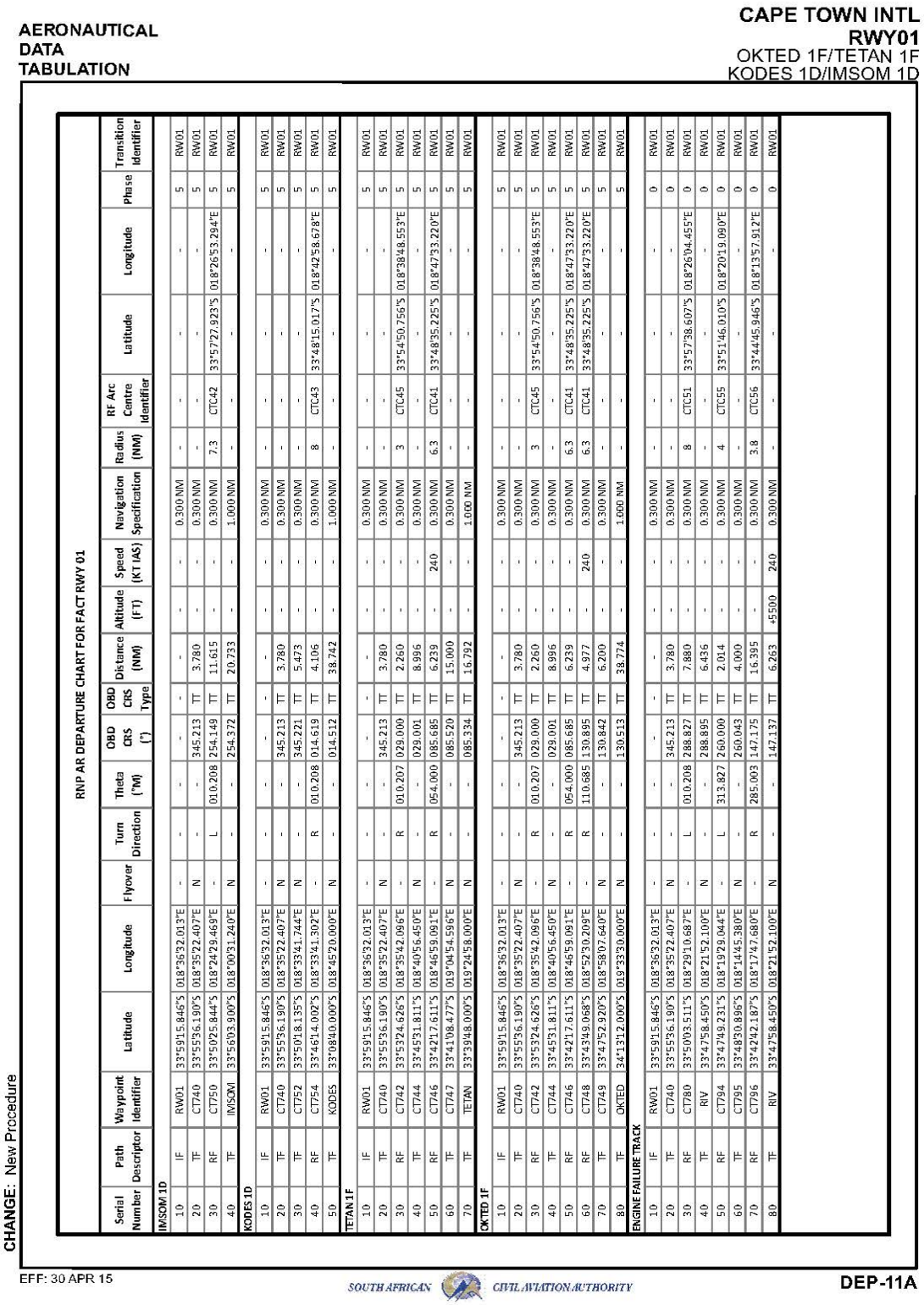
SOUTH AFRICAN CIVIL AVIATION AUTHORITY

RNAV-02A

I) Standard Terminal Departure Chart (RNAV (GNSS))



m) Standard Terminal Departure (RNAV (GNSS)) Data Tabulation Chart



AERONAUTICAL DATA TABULATION

CAPE TOWN INTL
RWY01
OKTED 1F/TETAN 1F
KODES 1D/IMSOM 1D

CHANGE: New Procedure

RNP AR DEPARTURE CHART FOR FACT RWY 01

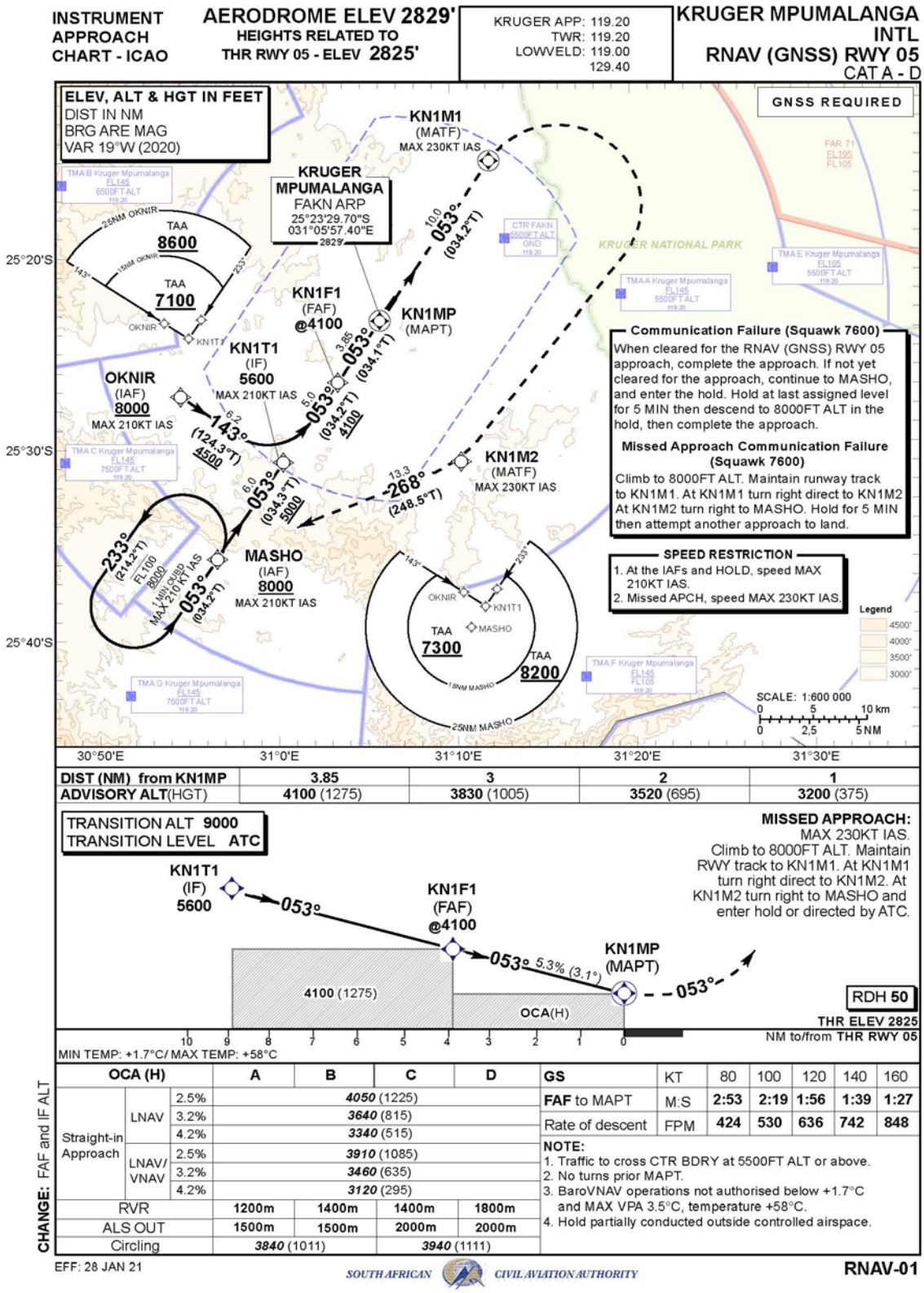
Serial Number	Path Descriptor	Waypoint Identifier	Latitude	Longitude	Flyover	Turn Direction	Theta (°M)	OBD CRS (°)	OBD CRS Type	Distance (NM)	Altitude (FT)	Speed (KT IAS)	Navigation Specification	Radius (NM)	RF Arc Centre Identifier	Latitude	Longitude	Phase	Transition Identifier
IMSOM 1D																			
10	IF	RW01	33°59'15.846"S	018°36'32.013"E	-	-	-	-	-	-	-	-	0.300 NM	-	-	-	-	5	RW01
20	TF	CT740	33°55'36.190"S	018°35'22.407"E	N	-	-	345.213	TT	3.780	-	-	0.300 NM	-	-	-	-	5	RW01
30	RF	CT750	33°50'25.844"S	018°24'29.469"E	-	L	010.208	254.149	TT	11.615	-	-	0.300 NM	7.3	CTC42	33°57'27.923"S	018°26'53.294"E	5	RW01
40	TF	IMSOM	33°56'03.900"S	018°00'31.240"E	N	-	-	254.372	TT	20.733	-	-	1.000 NM	-	-	-	-	5	RW01
KODES 1D																			
10	IF	RW01	33°59'15.846"S	018°36'32.013"E	-	-	-	-	-	-	-	-	0.300 NM	-	-	-	-	5	RW01
20	TF	CT740	33°55'36.190"S	018°35'22.407"E	N	-	-	345.213	TT	3.780	-	-	0.300 NM	-	-	-	-	5	RW01
30	TF	CT752	33°50'18.135"S	018°33'41.744"E	N	-	-	345.221	TT	5.473	-	-	0.300 NM	-	-	-	-	5	RW01
40	RF	CT754	33°46'14.002"S	018°33'41.302"E	-	R	010.208	014.619	TT	4.106	-	-	0.300 NM	8	CTC43	33°48'15.017"S	018°42'58.678"E	5	RW01
50	TF	KODES	33°09'40.000"S	018°45'20.000"E	N	-	-	014.512	TT	38.742	-	-	1.000 NM	-	-	-	-	5	RW01
TETAN 1F																			
10	IF	RW01	33°59'15.846"S	018°36'32.013"E	-	-	-	-	-	-	-	-	0.300 NM	-	-	-	-	5	RW01
20	TF	CT740	33°55'36.190"S	018°35'22.407"E	N	-	-	345.213	TT	3.780	-	-	0.300 NM	-	-	-	-	5	RW01
30	RF	CT742	33°53'24.626"S	018°35'42.096"E	-	R	010.207	029.000	TT	2.260	-	-	0.300 NM	3	CTC45	33°54'50.756"S	018°38'48.553"E	5	RW01
40	TF	CT744	33°45'31.811"S	018°40'56.450"E	N	-	-	029.001	TT	8.996	-	-	0.300 NM	-	-	-	-	5	RW01
50	RF	CT746	33°42'17.611"S	018°46'59.091"E	-	R	054.000	085.685	TT	6.239	-	240	0.300 NM	6.3	CTC41	33°48'35.225"S	018°47'33.220"E	5	RW01
60	TF	CT747	33°41'08.477"S	019°04'54.596"E	N	-	-	085.520	TT	15.000	-	-	0.300 NM	-	-	-	-	5	RW01
70	TF	TETAN	33°39'48.000"S	019°24'58.000"E	N	-	-	085.334	TT	16.792	-	-	1.000 NM	-	-	-	-	5	RW01
OKTED 1F																			
10	IF	RW01	33°59'15.846"S	018°36'32.013"E	-	-	-	-	-	-	-	-	0.300 NM	-	-	-	-	5	RW01
20	TF	CT740	33°55'36.190"S	018°35'22.407"E	N	-	-	345.213	TT	3.780	-	-	0.300 NM	-	-	-	-	5	RW01
30	RF	CT742	33°53'24.626"S	018°35'42.096"E	-	R	010.207	029.000	TT	2.260	-	-	0.300 NM	3	CTC45	33°54'50.756"S	018°38'48.553"E	5	RW01
40	TF	CT744	33°45'31.811"S	018°40'56.450"E	N	-	-	029.001	TT	8.996	-	-	0.300 NM	-	-	-	-	5	RW01
50	RF	CT746	33°42'17.611"S	018°46'59.091"E	-	R	054.000	085.685	TT	6.239	-	-	0.300 NM	6.3	CTC41	33°48'35.225"S	018°47'33.220"E	5	RW01
60	RF	CT748	33°43'49.068"S	018°52'30.209"E	-	R	110.685	130.895	TT	4.977	-	240	0.300 NM	6.3	CTC41	33°48'35.225"S	018°47'33.220"E	5	RW01
70	TF	CT749	33°47'52.920"S	018°58'07.640"E	N	-	-	130.842	TT	6.200	-	-	0.300 NM	-	-	-	-	5	RW01
80	TF	OKTED	34°13'12.000"S	019°33'30.000"E	N	-	-	130.513	TT	38.774	-	-	1.000 NM	-	-	-	-	5	RW01
ENGINE FAILURE TRACK																			
10	IF	RW01	33°59'15.846"S	018°36'32.013"E	-	-	-	-	-	-	-	-	0.300 NM	-	-	-	-	0	RW01
20	TF	CT740	33°55'36.190"S	018°35'22.407"E	N	-	-	345.213	TT	3.780	-	-	0.300 NM	-	-	-	-	0	RW01
30	RF	CT780	33°50'03.511"S	018°29'10.687"E	-	L	010.208	288.827	TT	7.880	-	-	0.300 NM	8	CTC51	33°57'38.607"S	018°26'04.455"E	0	RW01
40	TF	RIV	33°47'58.450"S	018°21'52.100"E	N	-	-	288.895	TT	6.436	-	-	0.300 NM	-	-	-	-	0	RW01
50	RF	CT794	33°47'49.231"S	018°19'29.044"E	-	L	313.827	260.000	TT	2.014	-	-	0.300 NM	4	CTC55	33°51'46.010"S	018°20'19.080"E	0	RW01
60	TF	CT795	33°48'30.896"S	018°14'45.380"E	N	-	-	260.043	TT	4.000	-	-	0.300 NM	-	-	-	-	0	RW01
70	RF	CT796	33°42'42.187"S	018°17'47.680"E	-	R	285.003	147.175	TT	16.395	-	-	0.300 NM	3.8	CTC56	33°44'45.946"S	018°13'57.912"E	0	RW01
80	TF	RIV	33°47'58.450"S	018°21'52.100"E	N	-	-	147.137	TT	6.263	≥5500	240	0.300 NM	-	-	-	-	0	RW01

EFF: 30 APR 15

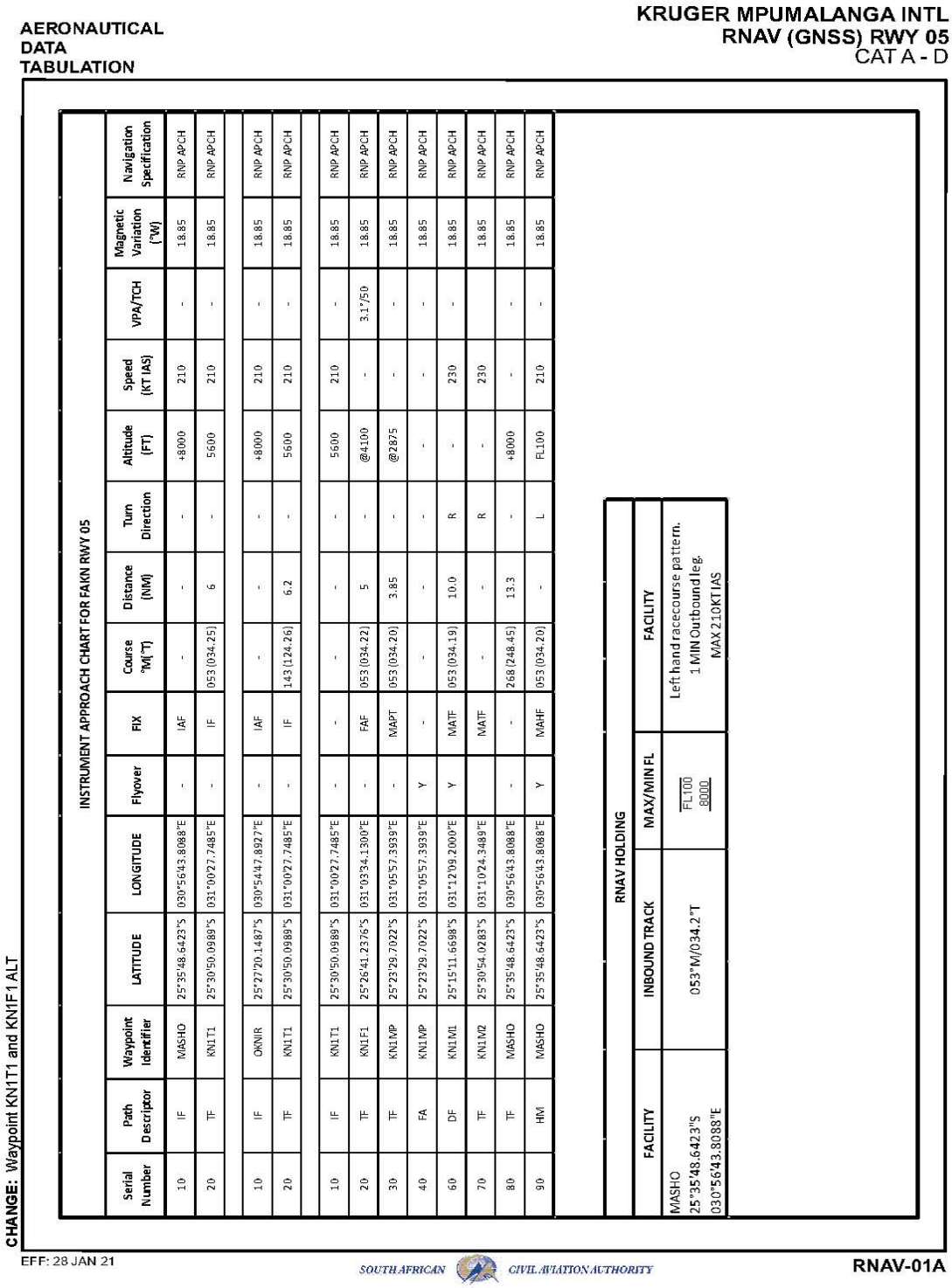
SOUTH AFRICAN CIVIL AVIATION AUTHORITY

DEP-11A

n) Instrument Approach Chart (RNAV (GNSS))



o) Instrument Approach (RNAV (GNSS)) Data Tabulation Chart



AERONAUTICAL DATA TABULATION

KRUGER MPUMALANGA INTL
RNAV (GNSS) RWY 05
CAT A - D

INSTRUMENT APPROACH CHART FOR FAKN RWY 05

Serial Number	Path Descriptor	Waypoint Identifier	LATITUDE	LONGITUDE	Flyover	FIX	Course °M(°T)	Distance (NM)	Turn Direction	Altitude (FT)	Speed (KT IAS)	VPA/TCH	Magnetic Variation (°W)	Navigation Specification
10	IF	MASHO	25°35'48.6423"S	030°56'43.8088"E	-	IAF	-	-	-	+8000	210	-	18.85	RNP APCH
20	TF	KN1T1	25°30'50.0989"S	031°00'27.7485"E	-	IF	053 (034.25)	6	-	5600	210	-	18.85	RNP APCH
10	IF	OKNIR	25°27'20.1487"S	030°54'47.8927"E	-	IAF	-	-	-	+8000	210	-	18.85	RNP APCH
20	TF	KN1T1	25°30'50.0989"S	031°00'27.7485"E	-	IF	143 (124.26)	6.2	-	5600	210	-	18.85	RNP APCH
10	IF	KN1T1	25°30'50.0989"S	031°00'27.7485"E	-	-	-	-	-	5600	210	-	18.85	RNP APCH
20	TF	KN1F1	25°26'41.2376"S	031°03'34.1300"E	-	FAF	053 (034.22)	5	-	@4100	-	3.1°/50	18.85	RNP APCH
30	TF	KN1MP	25°23'29.7022"S	031°05'57.3939"E	-	MAPT	053 (034.20)	3.85	-	@2875	-	-	18.85	RNP APCH
40	FA	KN1MP	25°23'29.7022"S	031°05'57.3939"E	Y	-	-	-	-	-	-	-	18.85	RNP APCH
60	DF	KN1M1	25°15'11.6698"S	031°12'09.2000"E	Y	MATF	053 (034.19)	10.0	R	-	230	-	18.85	RNP APCH
70	TF	KN1M2	25°30'54.0283"S	031°10'24.3489"E		MATF	-	-	R	-	230		18.85	RNP APCH
80	TF	MASHO	25°35'48.6423"S	030°56'43.8088"E	-	-	268 (248.45)	13.3	-	+8000	-	-	18.85	RNP APCH
90	HM	MASHO	25°35'48.6423"S	030°56'43.8088"E	Y	MAHF	053 (034.20)	-	L	FL100	210	-	18.85	RNP APCH

RNAV HOLDING

FACILITY	INBOUND TRACK	MAX/MIN FL	FACILITY
MASHO 25°35'48.6423"S 030°56'43.8088"E	053°M/034.2°T	FL100 8000	Left hand racecourse pattern. 1 MIN Outbound leg. MAX 210KT IAS

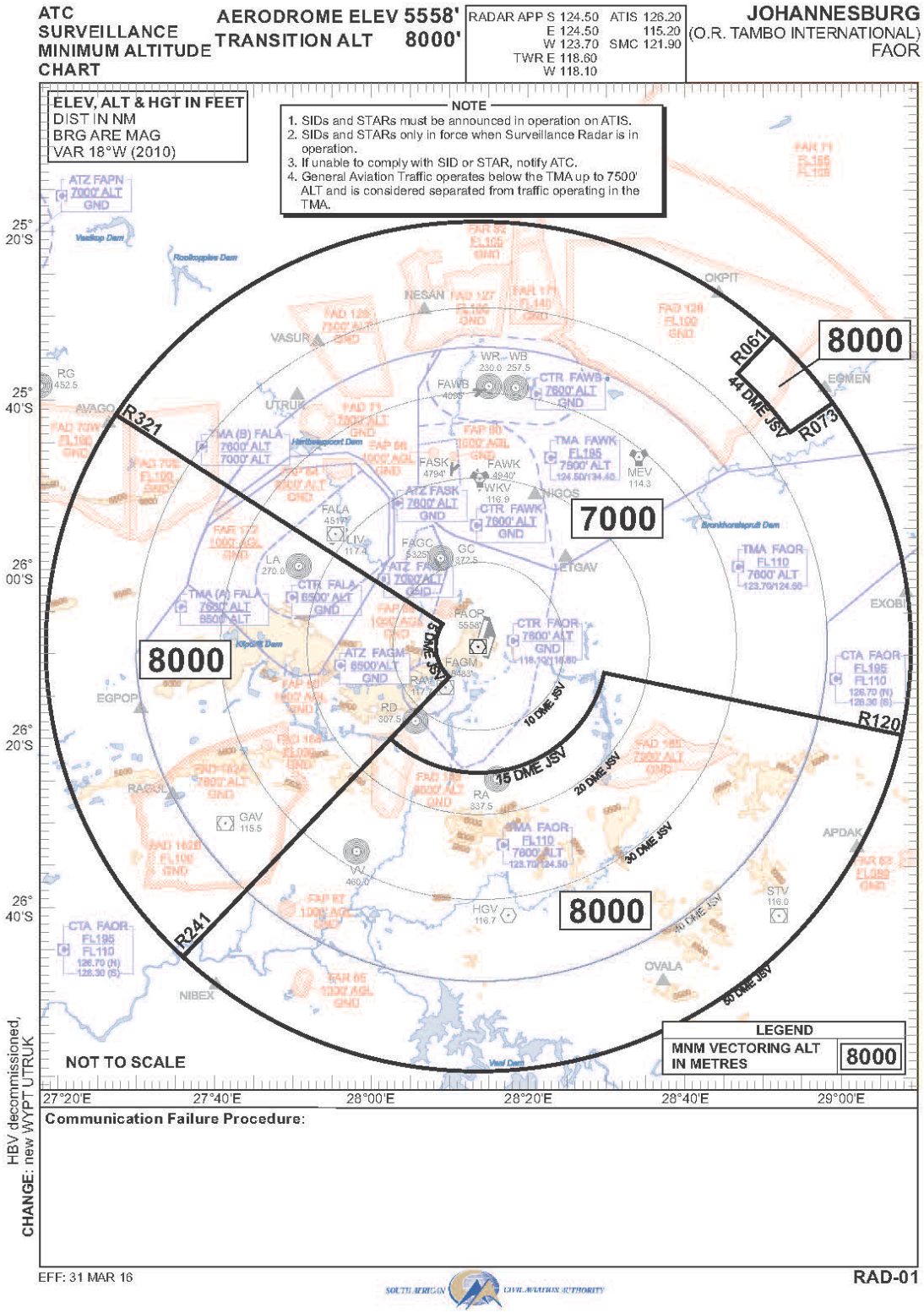
CHANGE: Waypoint KN1T1 and KN1F1 ALT

EFF: 28 JAN 21

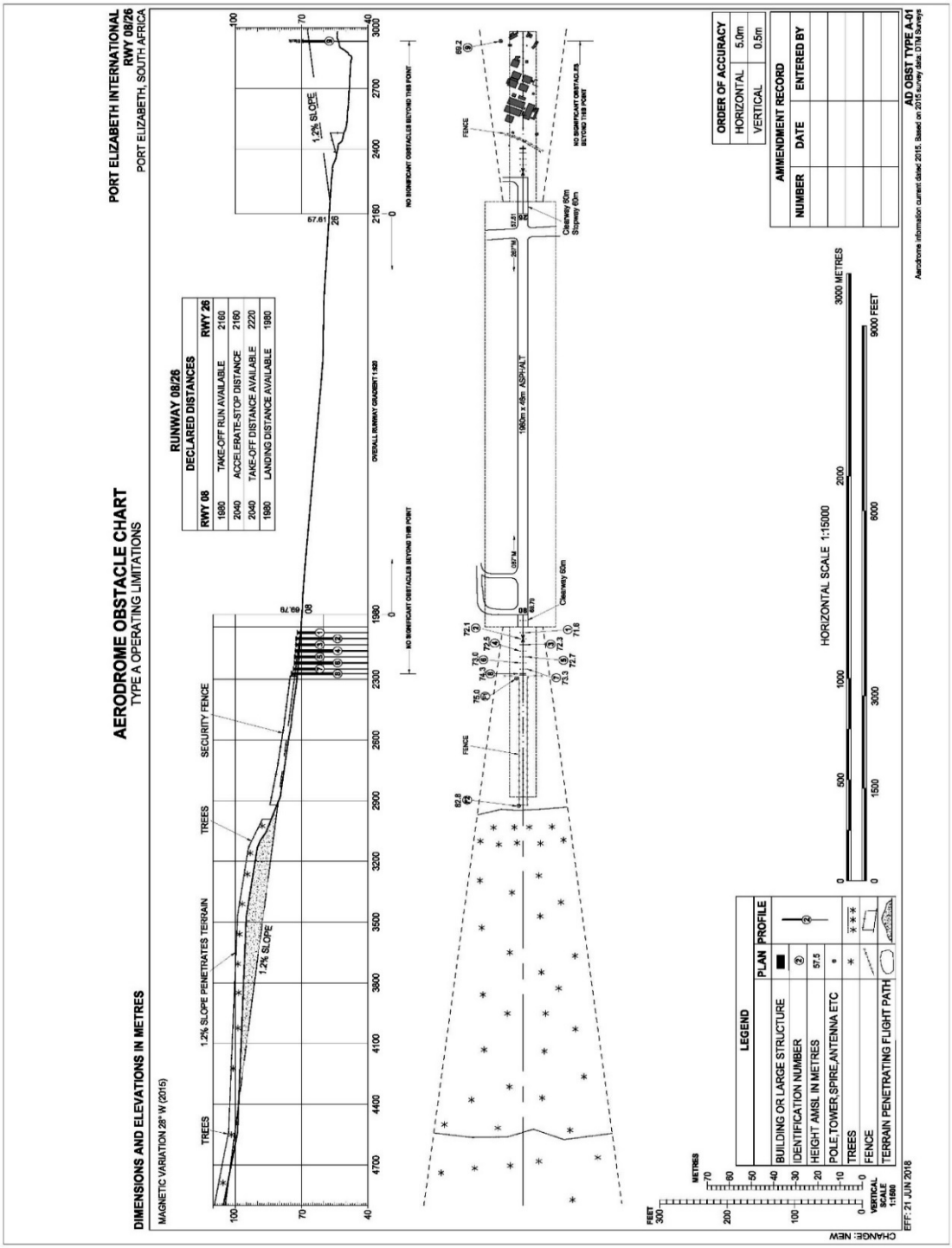
SOUTH AFRICAN CIVIL AVIATION AUTHORITY

RNAV-01A

p) ATC Surveillance Minimum Altitude Chart



q) Aerodrome Obstacle Chart Type A



53 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, SACARS-173, SACATS-173, SACARS-177 and SACATS-177

54 CHART MAINTENANCE

All charts shall be revised and maintained in accordance with ICAO design criteria, SACARS-173, SACATS-173, SACARS-177 and SACATS-177.

55 CHART APPROVAL

All charts shall be submitted to the SACAA for approval in accordance with SACARS-173, SACATS-173, SACARS-177 and SACATS-177 prior to publication.

56 POWER AND AUTHORITY OF INSPECTORS

Inspectors are designated as Authorised Officers in terms of Section 88 (1)(a) of the Civil Aviation Act No. 13 of 2009 and must show his/her authorisation to any person when required.

57 CONTINUOUS IMPROVEMENT, MEASUREMENT AND ANALYSIS

This TGM will be verified or continuously improved on in accordance with SACAA Continuous Improvement, Measurement and Analysis GP001.

END

APPENDIX A: PROCEDURE DESIGN PACKAGE (PDP)

The PDP shall be supplied to the SACAA for the validation/verification 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. The SACAA Validator can request additional information/mitigation not listed below.

1. DESIGN REPORT

1.1. The Design Report shall at least contain the following information:

1.1.1. Design Information

a) Name of the design organization.
b) Flight procedure designer who designed the procedure.
c) Flight procedure designer who verified and checked the procedure.
d) Approved User Requirement Specification (URS) in accordance with the approved ICAO Doc 9906.
e) Proof of Consultation with clients & affected parties.
f) Airport Name & ICAO Location Indicator.
g) Procedure Name.
h) Procedure Owner/Sponsor.
i) Runway Designator.
j) Category.
k) Version number.
l) Version date Record of Changes.

1.2. Airport infrastructure information

1.2.1. Any special local operational procedure.

1.2.2. Visual aids (ALS, VASI).

1.2.3. Noise abatement.

1.2.4. Non-standard traffic patterns.

1.2.5. Lighting activation.

1.2.6. Information on aerodrome obstacle limitation/safeguarding processes applied.

1.3. Supporting Information/Data used in the design

1.3.1. Projection(s) and projection parameters.

1.3.2. ISA.

1.3.3. UTM.

1.3.4. Version of ICAO Doc 8168 Vol II.

1.3.5. PBN Application/Navigation Specification.

1.3.6. Units of Measure.

1.3.7. Navigation Aid Data.

1.3.8. Software used for the design, including software version.

1.3.9. File name of Electronic Design Files.

1.3.10. Enclosures.

1.3.11. Appendixes.

1.3.12. Source Documents including version number & version date.

1.3.13. IFP summary.

1.3.14. Source origin & source date.

1.3.15. Segment start and end points.

1.3.16. TrD Calculations.

1.3.17. Distances used in the calculations.

1.3.18. Speeds.

1.4. Instrument procedure chart/depiction

1.4.1. Detail to safely navigate & identify significant terrain.

1.4.2. Airspace.

1.4.3. Obstacles and obstructions.

1.4.4. All applicable procedural information.

1.4.5. Instructions & Notes.

1.5. Obstacles

1.5.1. List of relevant obstacles for each segment.

1.5.2. Identification and description of the controlling obstacles per segment.

1.5.3. Obstacles otherwise influencing the design of the procedure.

1.5.4. WGS-84 Latitude & Longitude.

1.5.5. Height.

1.5.6. Elevation.

1.5.7. Primary or Secondary area location.

1.5.8. Area.

1.5.9. Applied MOC.

1.5.10. Horizontal & Vertical Tolerances applied.

1.5.11. Where the Controlling Obstacle data appears to be erroneous, make a note that the data appears to be erroneous and use the next highest obstacle. A list, per sector, of all the obstacles considered in that sector will assist with the validation of the Controlling Obstacle.

1.5.12. Procedure waypoint fixes

i. Proposed ARINC 424 path terminators (for PBN procedures only).

ii. Latitude & Longitude.
iii. Procedural tracks/course.
iv. Distances between waypoints.
v. MOCA.
vi. Published Altitudes.

1.6. Airspace constraints / considerations

i. CNS Requirements.
ii. ATS Requirements.
iii. NEMPAA Consent Letter if the procedure did not consider the specified & published MOCA.
iv. Adjacent Airspace infringement Letter of Consent / Agreement from ATM/ATCs.
v. ATS Service Provider to certify the procedure complies with air traffic requirements, where applicable.
vi. The flight procedure designer who designed the procedure to confirm that the procedure has been designed in accordance with user/air traffic requirements and design standards.

1.6.1. Design Details

i. Details, methodology & assumptions used.
ii. Alternative options considered by the designer.
iii. 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).
iv. 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.
v. Design Parameters and/or Calculations (including source data used in the calculations) to be provided in a chronological and unambiguous manner.
vi. True Headings/Tracks/Radials/Bearings, Magnetic Variation applied (including origin & epoch) & Magnetic Headings/Tracks/Radials/Bearings.

(Track 025°T + 21.5°W VAR = 046.5°M ≈ 047°M)

vii. Segment Climb/Descent Gradient.
viii. MOCA/Minimum Flight Altitude/Procedure Altitude.
ix. For non-standard IFP: training, operational or equipment procedure specific requirements.
x. Speed Limitation Points (SLP), applicable to/from a Fix.
xi. Communication Failure Procedures as well as Communication Failure Notes.
xii. Any additional notes, cautions, remarks, or recommendations.

1.6.2. Other

i. Another flight procedure designer to certify that the procedure documentation has been verified for correctness as well as compliance with user/air traffic requirements and design standards.
ii. Chief Designer responsible for FPD to certify that the procedure complies with user/air traffic requirements.

iii. Chief Designer is the manager responsible for Charting to certify that the proposed chart is compliant with ICAO Annex 4, Doc 8697 and the SACAA Manual of Standards (Charting) requirements.

2. ELECTRONIC DESIGN FILES

2.1. Design File in electronic format, including all other electronic files used shall be supplied to assist with the validation and approval process. The electronic folders should be in a chronological order for example;

2.1.1. Correspondence

URS

Proof of agreements

2.1.2. Supporting Information

CAD Drawing Files

Calculations

Depictions & Mitigations

Obstacle Data

2.1.3. PDP

IAC

Report

Tabulation Chart

Textual Description

2.1.4. Supplementary Information

Other design considerations (PAPI Angle, other procedures, etc. Refer to 8168 QA section & 9906 Vol I)

3. SUPPLEMENTARY INFORMATION

3.1. This implies 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:

3.1.1. Supplementary charts/images adequately annotated and labeled to fit the purpose of the chart/image.

3.1.2. ICAO Annex 14 OLS assessments.

3.1.3. Aeronautical studies/Safety cases.

APPENDIX B: GROUND VALIDATION PACKAGE (GVP)

The GVP shall be supplied to the SACAA for the validation/verification of validated flight procedures and will be submitted in the following format as a minimum. These lists are not exhaustive and additional documents can be added to the GVP or be requested by the SACAA for validation purposes. The SACAA Validator can request additional information/mitigation not listed below.

Relevant signatures, comprehensive notes must be included, and a final conclusion should affirm the status of the validated procedure.

1. SACAA PART 173 GND Validation Checklist – SID v0.1.xlsx
2. SACAA PART 173 GND Validation Checklist – STAR v0.1.xlsx
3. SACAA PART 173 GND Validation Checklist – IAP v0.5.xlsx

APPENDIX C: FLIGHT SIMULATION/VALIDATION REQUIREMENTS

Refer to ICAO Doc 9906

1. FLIGHT SIMULATION REQUIRED

1.1. SID's with demanding climb gradients and level restrictions

1.2. RNP AR type procedures

1.3. Airspace containment

1.4. Procedures that will impact on other procedures in complex airspace

1.5. Where a large number of procedures is introduced at the same time in the same airspace or adjoining airspace

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.

2. FLIGHT VALIDATION CHECK REQUIRED

2.1. New procedures where there are no published procedures to the same RWY.

2.2. 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.)

2.3. When accuracy/integrity of data used in the IFP design and/or the Aerodrome environment is not assured.

3. NIGHT FLIGHT VALIDATION REQUIRED

3.1. New procedures to a new airport.

3.2. 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.

3.3. If the approach lighting system installed does not comply with ICAO or National standards.