# ADVISORY CIRCULAR

**CAA-AC-AGA106**

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## ADVISORY CIRCULAR ON OPTIMIZATION AND SELECTION OF PROPOSED SITE FOR CONSTRUCTION OF AERODROME

### 1.0 PURPOSE

This Advisory Circular provides Aerodrome proprietors with guidance on the criteria and attributes to be considered when selecting site for the construction of an aerodrome.

In several occasions, selection of an aerodrome site is challenging aspect as it encompasses a combination of complex technical and investment factors to be adhered by the prospective aerodrome operator in order to optimize selection of the site in the interest of aviation safety. Adequately planned selection of the site for construction of an aerodrome will largely result in appropriate use of resources, usability of the aerodrome and protection of investment.

### 2.0 REFERENCES

2.1 Civil Aviation (Aerodrome) Regulations
2.2 ICAO Annex 14 – Volume I
2.3 ICAO Doc 9184 – Part 1 – Airport Planning Manual
2.4 ICAO Doc 9981 PANS Aerodromes

### 3.0 PRELIMINARY CONSIDERATION FOR THE SELECTION OF THE SITE

The initial stage for selection of site for construction of an aerodrome demands assessment of the suitability of the existing site in terms of the purpose for construction of the facility. In essence this require adequate forecast of the usability, return to investment and expected growth of traffic as a result of socio economical aspects connected with providing the facility. It is a prerequisite to define the investment in terms of operational context and accrual economic benefits from passenger and cargo growth.

It is then necessary to define the type of airport and the operational systems for the forecast passenger and cargo traffic. Based on this information, the actual process of site selection falls into several major steps commencing with an assessment of the shape and size of the area required for the airport, the location of sites with potential for development, followed by examination and evaluation of these sites.

Selection of the site normally involves several major steps ranging from establishing physiographic features such as shape and size and expected development as a result of investment in the facility; and subsequently actual evaluation based on engineering, topographic, flight operation and meteorological considerations.

## 4.0 SALIENT FEATURES FOR SELECTION AND EVALUATION OF A SITE

The main features that should be taken into consideration during selection and evaluation of a new site for aerodrome construction includes, but not limited to the following:

a) Detailed Study of area required for the intended operations

b) Land acquisition aspects

c) Evaluating factors affecting aerodrome location;

d) Preliminary desk study of the proposed site and other sites in the vicinity

e) Conducting on-site inspection;

f) Environmental and social impact assessment (ESIA);

g) Comparative analysis of potential sites;

h) Civil – Military coordination;

i) Preparation of Conceptual Design, Quantities and Cost for development of the facility;

j) Final evaluation and decisions

k) Report and recommendations

Details of the above salient features are briefly discussed in the following sections.

### 4.1 Detailed Study of Area Required for the Intended Operations

Before embarking on conducting on-site inspection of the proposed site, it is important to have an understanding of the area likely to be required for the intended aircraft operation. This is achieved by drawing attention to the ground space required for the major facility of an aerodrome. The major aspects of considerations include:

a) Runway length on account of critical operations; To avoid imposing unnecessary aircraft operating restrictions and incurring disproportionate construction and maintenance costs, adequate space should be provided to permit runways to be developed to meet long-term requirements.

b) Runway orientation on account of prevailing wind conditions; In broad terms, runways should be oriented so that aircraft are not directed over populated areas and obstructions are avoided. Subject to all other factors being equal they should be oriented in the direction of the prevailing wind when it blows consistently from one direction.

c) Number of Runways on account of prevailing operational requirements; A sufficient number of runways is required to meet the forecast aircraft traffic demand, i.e.the number of aircraft, mixture of aircraft types and the mixture of arrivals and departures to be accommodated in one hour during the busiest periods.

d) A complex combination of the above for the facility based on available space;

### 4.2 Land Acquisition

Among the most challenging aspects is the land acquisition issue. In several occasions, the land identified or selected for the construction of the aerodrome is occupied by local communities, their farms and homes. It is therefore important to ensure that land is acquired without causing major disruption of lives by implementing Resettlement Action Plans (RAP) associated with equitable compensation. In cases where the prospective aerodrome operator owns the land possession of Title Deeds should form part of submission to the authority for validation.

### 4.3 Evaluating Factors Affecting Proposed Aerodrome Location

Upon completion of assessment of the land available for development of an aerodrome, it is prerequisite to determine other factors that will make the airport functionally viable leading to return of investment, growth of business and certainly usable. Among the most important to evaluate include the following:

a) Present and expected growth of Aviation Activity – adequate study of the level of aviation activity in terms of frequency of operation should be made by consulting various stakeholders such as aircraft operators and business opportunities;

b) Development and Investment Plans in the vicinity – Consultation with the other Authorities on the investment portfolio of the area should be made to enable establish viability for constructing an aerodrome;

c) Dominant Climatic condition – understanding of prevailing meteorological conditions such as wind, dust storms, fog, low cloud or any other unique atmospheric condition should be established;

d) Inter-modal transportation – Availability of other modes of transports should be established to enable accessibility to and from the aerodrome. This includes; roads, railways and public transport;

e) Consideration for Future Expansion – Availability of sufficient size of land for future expansion should be dealt with during the initial stages of the design concept. This issue is normally covered within Airport Master Plan in sufficient details. Experience shows that disregard of this consideration has led to encroachment of land around the boundaries of the airport and subsequently protracted legal disputes whenever land in the proximity is claimed by the aerodrome operator;

f) Topography – consideration of the terrain relief, presence of natural, obstacles and soils geotechnical and drainage characteristics should be known through studies of

topography and soil investigations. In addition study of available geological maps and topographical maps should be conducted.

g) Aerodromes in the Vicinity – it is important to note location and physical characteristics of other aerodromes in the vicinity including pre-existing ATS routes and procedures;

h) Availability of Utilities – the prospective aerodrome should definitely need to be adjoined to existing utilities such national electricity grid, water supply, sewerage system and telephone lines;

**4.4 Preliminary Desk Study of the Proposed Site and Other Sites in the Vicinity**

After establishing size, type and ascertaining location factors in accordance with 4.3 above, then Conceptual Design of the aerodrome is carried. The conceptual design is done by bringing together the aforementioned factors, desk studies and plans.

The developed assessment of conceptual drawings will eliminate undesirable options to achieve optimal design of the facility.

**4.5 Conducting On-site Inspection**

After preliminary study, an on-site inspection is conducted to ascertain the topographical features and possible site area to be selected from among options brought up. The selection of the appropriate site is an optimization process which requires a better understanding of cost and operational safety considerations. A model attached as Annex A should be used for on-site inspection.

Among the most important aspects to cover during the on-site inspection include the following:

a) Airspace – Consideration on the restrictions and difficulties that may arise from airspace usage should be assessed on site;

b) Obstacles – Establishing location, type, size and associated hazard that may be posed by the obstacles must be made;

c) Weather – prevailing weather condition should reliably established for the optimal site;

d) Visual Aids – Assessment on the need to install visual aids to ensure safe operation of aircraft;

e) Ground Accessibility – the aerodrome site should be accessible by other modes of transports;

f) Land Use – it should be noted that aerodrome should be located so that a compatible situation is created and preserved with existing forms of land use and tenure. Coordination with other authorities is paramount to achieving consensus on land use issue;

g) Topography – On site inspection of the proposed sites will enable establish terrain relief, land use, water bodies, existence of man-made and natural features that may have direct impact in operation of aircraft;

h) Soils and Construction Material – the geotechnical conditions of the existing subsoil greatly affect construction costs especially when expansive subgrade soils are encountered. In addition, quantities, quality and haul distances of construction material from quarries and borrow sites should be established.

i) Cost Effectiveness – to ensure equitable return for investment aspects such as topography, land compensation, soils and construction material availability should be properly assessed among other factors to achieve cost effectiveness;

### 4.6 Environmental and Social Impact Assessment (ESIA)

Environment and social impact assessment should be conducted to understand potential hazards to the environment and livelihood of the societies as a result of airport development project. The ESIA study is normally part of the preliminary study whose reports must be reviewed and approved by environmental bodies of the Partner State such as NEMA, REMA and NEMC.

### 4.7 Comparative Analysis of Potential Sites

At this stage, upon making analysis and identifying potential benefits and disbenefits of various sites, one optimal site is selected based on the desk study, on-site inspection and feasibility studies. The unsuitable sites are normally excluded from the alternative option list.

### 4.8 Civil – Military Coordination

Most aerodromes have a combination of civil and military operations. It is therefore essential that civil-military coordination is implemented during the selection of the site to derive agreement on the use of the aerodrome for both operations.

### 4.9 Preparation of Conceptual Design, Quantities and Cost for development of the facility;

Consideration on the merits for the selected site shall involve:

i. Detailed topographical and cadastral survey to establish boundaries and terrain relief;

ii. Preparation of aerodrome layouts and;

iii. Bill of Quantities

### 4.10 Final Evaluation and Decisions

At this level, different alternative options undergo comparative analysis and under normal circumstances cost factors and capital investment issues are properly assessed by engineering economists. In principal, cost – benefits analysis are thoroughly conducted to achieve optimal design and cost effective solutions. However, the final evaluation requires an assessment based on comparison of operational, social and cost efficiency. Table below shows factors for consideration:

| S.No | Evaluation Factor | Element |
|---|---|---|
| 1 | Operational | I. Land availability<br>II. Airspace availability<br>III. Effects of restrictions on operational |

| | | |
|---|---|---|
| | | efficiency;<br>IV. Potential capacity<br>V. Civil- Military interaction |
| 2 | Social | I. Proximity to demand centre;<br>II. Ground accessibility;<br>III. Potential noise problem<br>IV. Land use and control measures |
| 3 | Cost | I. Cost-benefit |

### 4.11 Report and Recommendation

A comprehensive report including drawings should be prepared, consisting of the following elements;

a) The results of the site inspection and evaluation;

b) Ranking the alternative options for candidate sites based on flight operation and engineering considerations;

c) Providing recommendations based on multiple factors in the evaluation of alternative site.

UGANDA CIVIL AVIATION AUTHORITY
DIRECTOR
SAFETY, SECURITY AND ECONOMIC REGULATION

**Director Safety, Security and Economic Regulation**

## Annex A

### CHECKLIST FOR SELECTION AND EVALUATION OF SITE FOR CONSTRUCTION OF AERODROME

| | | |
|---|---|---|
| 1. | **Name of Operator** | |
| 2. | **Physical address** | |
| 3. | **Postal address** | |
| 4. | **Phone number** | |
| 5. | **Fax number** | |
| 6. | **Mobile number** | |
| 7. | **Email** | |
| 8. | **Name of Aerodrome Personnel** | |
| 9. | **Date of inspection** | |
| 1 | **Time in** | |
| 1 | **Services inspected** | Selection of aerodrome site |
| | | |

| | |
|---|---|
| **Aerodrome Personnel** | Name: |
| | Signature: |

The abbreviations Y, N, NA and F as applied in this checklist have the following interpretations

Y Yes
N No
NA Not applicable
F Finding

| | INSPECTION/EVALUATION AREA | COMMENT/OBSERVATION |
|---|---|---|
| **1.** | **PHYSICAL CHARACTERISTICS AND DATA** | |
| 1.1 | Representative location coordinates in WGS 84 (degrees, minutes, seconds) | |
| 1.2 | Highest elevation of the site AMSL (feet) | |
| 1.3 | Proposed RWY Length and width (metres) based on 4.1 below | |
| 1.4 | Distance of proposed area from the nearest city/town etc. (kilometres) | |
| 1.5 | Location and distance of alternate aerodrome | |
| 1.6 | Available aeronautical charts for airspace organization and ATS routes | |
| 1.7 | Available topographical maps (scale 1:50.000 or 1:100,000) | |
| 1.8 | Available cadastral survey data for establishment of aerial boundaries for the site | |
| 1.9 | Consideration for future aerodrome expansion (master planning) | |

| **Comments** |
|---|
| |

| | INSPECTION/EVALUATION AREA | COMMENT/OBSERVATION |
|---|---|---|
| **2.** | **GROUND ACCESSIBILITY** | |
| 2.1 | Site accessibility by other modes of transport | |
| 2.2 | Are access roads conditions provide for year round accessibility to ad from the site? | |
| 2.3 | Are there any improvements/coordination with other Authorities required to ensure accessibility is convenient?? | |
| **Comments** | | |

| | INSPECTION/EVALUATION AREA | COMMENT/OBSERVATION |
|---|---|---|
| **3.** | **CLIMATOLOGICAL DATA** | |
| 3.1 | Total annual rainfall | |
| 3.2 | Maximum monthly average rainfall | |
| 3.3 | Any climatic occurrences such flooding, fog, dust storms, low cloud etc. | |
| 3.4 | Prevailing wind condition determination | |
| 3.5 | Maximum temperature of the hottest month | |
| 3.6 | Any unusual weather condition reported | |
| 3.7 | Source of climatic data and validation | |
| **Comments** | | |

| | INSPECTION/EVALUATION AREA | COMMENT/OBSERVATION |
|---|---|---|
| **4.** | **PRELIMINARY DESIGN DATA** | |
| 4.1 | Critical aircraft expected to use the runway | |
| 4.2 | Recommended runway, taxiway and apron , sizes (length, width in metres) based on planned critical operations | |
| 4.3 | Percentage wind coverage to provide for orientation of the runway | |
| 4.4 | Crosswind conditions (if available) | |
| 4.5 | Types of Obstacles, natural or man-made | |
| 4.6 | Are obstacles posing any danger to aircraft operation? | |
| **Comments** | | |

| | INSPECTION/EVALUATION AREA | COMMENT/OBSERVATION |
|---|---|---|
| **5.** | **SOIL , CONSTRUCTION MATERIALS CONDITIONS AND OTHER CONSIDERATION** | |
| 5.1 | Description of type of natural subgrade soils | |
| 5.2 | Description, quantity and quality of construction material | |
| 5.3 | Drainage condition of site based on topographical map and site inspection | |
| 5.4 | Availability of utilities such as sewerage, telephone, electricity power, sewerage system | |
| 5.5 | Requirement for airfield lighting system on completion of runway including any other visual aids | |
| 5.6 | Requirement for navigation aids | |
| **Comments** | | |

| | INSPECTION/EVALUATION AREA | COMMENT/OBSERVATION |
|---|---|---|
| **6.** | **COORDINATION WITH RELEVANT AUTHORITIES** | |
| 6.1 | Coordination with land use and zoning authorities such as District/Regional/County Administration | |
| 6.2 | Approval/disapproval of Environmental Impact Assessment and mitigation measures | |
| 6.3 | Availability of Resettlement Action Plan (RAP) | |
| 6.4 | Civil – Military Coordination on the use | |
| **Comments** | | |