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AERODROME & GROUND AID
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|----------|--------------------------------------------------------------|-----------------|-----------------------------------------|
| SUBJECT: | SURFACE MOVEMENT GUIDANCE AND CONTROL SYSTEMS | DATE INITIATED: | MARCH 1, 2024 |
| | | INITIATED BY: | DIRECTOR, AVIATION SAFETY REGULATION |

1. PURPOSE

- 1.1 This Advisory Circular (AC) provides guidance for the implementation and maintenance of Surface Movement Guidance and Control Systems.

2. REFERENCES

- 2.1 Civil Aviation Requirements for Certified Aerodromes Chapter 9.8

3. GENERAL

- 3.1 The term "Surface Movement Guidance and Control System (SMGCS)" stands for a system of aids, facilities and procedures designed to meet the requirements for guidance and control of surface traffic consistent with the operational conditions at a particular aerodrome. All aerodromes have some form of SMGCS.
- 3.2 An SMGCS comprises of an appropriate combination of visual aids, radiotelephony communications, procedures, control, and information facilities.
- 3.3 The main reason for providing an SMGCS is to enable an aerodrome to cope safely with the ground movement demands placed on it under specified operational conditions. The system should therefore be designed to prevent collisions between aircraft, between aircraft and ground vehicles, between aircraft and obstacles, between vehicles and obstacles, and between vehicles.
- 3.4 It should be emphasized that an SMGCS should be designed so as to maintain regularity of movement under varying operational conditions. Regularity of operations suffer under heavy traffic conditions and when visibility conditions are reduced. The objective is to have a system which is compatible with the landing and take-off capacity of the runway and with the demands placed on the aerodrome. To this end, the requirements of both landing and take-off operations should be taken into account when designing an SMGCS. At some airports, it may be that takeoff operations occur in lower visibilities than landing operations.

- 3.5 The system should be appropriate to the visibility and traffic density and should provide:
1. *Requirements of a general nature:*
 - a) Communication capability between the Air Traffic Services and persons, vehicles, and aircraft on the movement area.
 2. *Requirements of Air Traffic Services:*
 - a) information on the identity, position and progress of aircraft including aircraft under tow;
 - b) information on the identity, position and progress of ground vehicles whose movements might conflict with aircraft movements;
 - c) information on the presence of temporary obstacles or other hazards;
 - d) information on the operational status of elements of the system; and
 - e) facilities appropriate to the control to be exercised.
 3. *Requirements of ground vehicles on the movement area*
 - a) emergency vehicles
 - i. information on the route to be followed;
 - ii. guidance along the route being followed;
 - iii. capability to locate the site of an emergency;
 - iv. information to prevent collision with aircraft and ground vehicles; and
 - b) other ground vehicles
 - i. information on the route to be followed;
 - ii. guidance along the route being followed;
 - iii. information to prevent collision with aircraft and ground vehicles.

4. OPERATIONAL REQUIREMENTS

- 4.1 The level of the SMGCS that is provided at an aerodrome should be related to the operational conditions under which it is intended that the system shall operate. It is important to recognize that a complex SMGCS is not needed and is uneconomic at aerodromes where visibility, aerodrome layout complexity and traffic density, separately or in combination, do not at present cause problems for the ground movement operations of aircraft and vehicles. However, failure to provide an SMGCS with a capacity properly matched to the operational demands at an aerodrome will restrict the movement rate and may affect safety.
- 4.2 All SMGCS have four basic functions:
- a) **Guidance:** which consists of the facilities, information and advice that are necessary to provide continuous, unambiguous and reliable information to pilots of aircraft and drivers of vehicles to keep their aircraft or vehicles on the surfaces and assigned routes intended for their use;
 - b) **Routing:** which is the planning and assignment of a route to individual aircraft and vehicles to provide safe, expeditious and efficient movement from the current position to the intended position;

- c) **Control:** which is the application of measures to prevent collisions and runway incursions thereby ensuring safe, expeditious and efficient ground movements; and
- d) **Surveillance:** which provides identification and accurate positional information on aircraft, vehicles, and other objects.

5. THE ROLE OF VISUAL AIDS

5.1 Visual aids have a role in the guidance, routing, and control functions of SMGCS. There are a number of high-level goals in the design of any system that relate specifically but not always exclusively to the provision of visual aids. These are:

- a) an SMGCS should be able to accommodate all aircraft and authorized vehicles;
- b) the guidance function should support safe operations on the aerodrome considering the visibility conditions, traffic density and aerodrome layout;
- c) pilots and vehicle drivers should be able to follow their assigned routes in a continuous, unambiguous and reliable way;
- d) visual aids should be an integral component of the surface movement system; and
- e) an SMGCS should be implemented in a modular form to allow for system growth as the operational situation changes.

5.2 When visibility conditions permit a safe, orderly, and expeditious flow of authorized movements by visual means, the guidance function of an SMGCS will be based primarily on standardized visual aids using markings, lighting, and signs. When visibility conditions are sufficient for pilots to taxi by visual reference alone, but the sole use of conventional visual aids restricts the expeditious flow of authorized movements, additional visual or non-visual systems may be needed to support the guidance function. Any additional visual aids that are developed should be standardized in accordance with ICAO practices.

5.3 Once a route has been assigned, then a pilot or vehicle driver requires information to follow that route. Visual aids provided for guidance indicate where an aircraft or vehicle can be safely maneuvered.

5.4 Pilots and vehicle drivers always require some form of routing and guidance information. At many aerodromes, visual aids will also be required to be part of the control function. Surveillance information is needed to support this service.

6. Determination of Visual Aids and Communication required are based on the scope of Aerodrome Operation.

6.1 VISIBILITY AND TRAFFIC CONDITIONS

6.1.1 The visibility conditions under which the aerodrome authority plans to maintain operations and the traffic density are the two most important factors to be considered when selecting components for a SMGCS for an airport.

For the purpose of discussing SMGCS, visibility and traffic conditions have been subdivided and defined according to the terms indicated below.

6.2 VISIBILITY CONDITIONS:

6.2.1 1 - Visibility sufficient for the pilot to taxi and to avoid collision with other traffic on taxiways and at intersections by visual reference, and for personnel of control units to exercise control over all traffic on the basis of visual surveillance;

2 - Visibility sufficient for the pilot to taxi and to avoid collision with other traffic on taxiways and at intersections by visual reference, but insufficient for personnel of control units to exercise control over all traffic on the basis of visual surveillance; and

3 - Visibility less than 350m RVR (low visibility operations).

6.2.2 TRAFFIC DENSITY

(the mean busy hour is determined by the operator of the aerodrome using a peak hour matrix)

Light - Not greater than 15 movements per runway or typically less than 20 total aerodrome movements;

Medium - Of the order of 16 to 25 movements per runway or typically between 20 to 35 total aerodrome movements; and

Heavy - Of the order of 26 or more movements per runway or typically more than 35 total aerodrome movements.

6.2.3 Based on the visibility condition and traffic density aerodrome operators are required to use the Tables #1&2 below to determine the optimum SMGCS for the aerodrome.

6.2.4 Aerodrome operators are required to reevaluate the SMGCS when the aerodrome operations have changes so as to ensure at least the optimum SMGCS is achieved.

Approved by:



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Table #1 Guidance on selecting SMGCS Aids

| Aid | Traffic condition - Visibility condition - | Light Medium Heavy | | | | | | | | | GCAA Document Reference |
|-----------------------------------------------|-------------------------------------------------------|---------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------------------------------------------|
| | | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | |
| Apron markings | | x | x | x | x | x | x | x | x | x | Current AGA Requirements Chapter 5 |
| Runway centreline marking | | x | x | x | x | x | x | x | x | x | Current AGA Requirements Chapter 5 |
| Taxiway centreline marking | | x | x | x | x | x | x | x | x | x | Current AGA Requirements Chapter 5 |
| Taxi-holding position marking | | x | x | x | x | x | x | x | x | x | Current AGA Requirements Chapter 5 |
| Visual aids for denoting restricted use areas | | x | x | x | x | x | x | x | x | x | Current AGA Requirements Chapter 7 |
| Runway edge lights | | x | x | x | x | x | x | x | x | x | Current AGA Requirements Chapter 5 |
| Taxiway edge lights | | x | x | x | x | x | x | x | x | x | Current AGA Requirements Chapter 5 |
| Obstacle lighting | | x | x | x | x | x | x | x | x | x | Current AGA Requirements Chapter 6 |
| Signs | | x | x | x | x | x | x | x | x | x | Current AGA Requirements Chapter 5 |
| Taxiway intersection marking | | x | x | x | x | x | x | x | x | x | Current AGA Requirements Chapter 5 |
| Charts (aerodrome, movement, apron) | | x | x | x | x | x | x | x | x | x | Current AGA Requirements Chapters 13, 14, 15 |
| Aerodrome control services | | x | x | x | x | x | x | x | x | x | |
| Signaling lamp | | x | x | x | x | x | x | x | x | x | Current AGA Requirements Chapter 5 |
| Radiotelephony equipment | | x | x | x | x | x | x | x | x | x | Current AGA Requirements Chapter 6 |

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|-----------------------------------------|--|---|---|--|---|---|---|---|---|---|------------------------------------|
| Electrical monitoring system for lights | | x | x | | x | x | x | x | x | x | Current AGA Requirements Chapter 8 |
| Secondary power supply | | | x | | x | x | | | x | | Current AGA Requirements Chapter 8 |

Table # 2 Guidance on Selecting SMGCS aids

| Traffic condition - | | Light | | | Medium | | | Heavy | | | GCAA/ICAO Document Reference | |
|----------------------------------------------------------|------------------------|-------|---|---|--------|---|---|-------|---|---|------------------------------|------------------------------------|
| Procedure | Visibility condition - | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | | |
| | | | | | | | | | | | | |
| Aerodrome Operator | | | | | | | | | | | | |
| Periodic electrical monitoring of SMGC aids | | x | x | x | x | x | x | x | x | x | x | Current AGA Requirements Chapter 8 |
| Designation of taxiways | | x | x | x | x | x | x | x | x | x | x | |
| Movement area inspection and reporting | | x | x | x | x | x | x | x | x | x | x | Current AGA Requirements Chapter 2 |
| Directive of ground staff conduct on the movement area | | x | x | x | x | x | x | x | x | x | x | |
| Initiation of amendment of aerodrome charts as necessary | | x | x | x | x | x | x | x | x | x | x | |
| Directive of ground staff radiotelephony procedures | | x | x | x | x | x | x | x | x | x | x | Annex 10, PANS-RAC |

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