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The Role of the Global Navigation Satellite System (GNSS) in Supporting Airport Surface Operations

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Foreword

This document was prepared by RTCA Special Committee 159 (SC-159). This document was approved by the RTCA Program Management Committee (PMC) on January 7, 1999.

RTCA, Incorporated is a not-for-profit corporation formed to advance the art and science of aviation and aviation electronic systems for the benefit of the public. The organization functions as a Federal Advisory Committee and develops consensus-based recommendations on contemporary aviation issues. RTCA's objectives include, but are not limited to:

- Coalescing aviation system user and provider technical requirements in a manner that helps government and industry meet their mutual objectives and responsibilities;
- Analyzing and recommending solutions to the system technical issues that aviation faces as it continues to pursue increased safety, system capacity and efficiency;
- Developing consensus on the application of pertinent technology to fulfill user and provider requirements, including development of Minimum Operational Performance Standards (MOPS) for electronic systems and equipment that support aviation; and
- Assisting in developing the appropriate technical material upon which positions for the International Civil Aviation Organization (ICAO) and the International Telecommunication Union (ITU) and other appropriate international organizations can be based.

The organization's recommendations are often used as the basis for government and private sector decisions as well as the foundation for many Federal Aviation Administration Technical Standard Orders (TSO).

Since RTCA is not an official agency of the United States Government, its recommendations may not be regarded as statements of official government policy unless so enunciated by the United States Government organization or agency having statutory jurisdiction over any matters to which the recommendations relate.

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1. INTRODUCTION

1.1 Background

RTCA has undertaken a series of activities to explore the various operational applications for GNSS and to develop the associated GNSS performance standards. These activities are an outgrowth of the RTCA Task Force on GNSS Transition and Implementation [1]. The task force identified many potential benefits for aviation users resulting from the use of GNSS, and encouraged the early exploitation of GNSS capabilities to support key operational applications.

One of the planned applications is to use GNSS as an element of an advanced surface movement guidance and control system (A-SMGCS) to enhance airport surface operations. There is a need to improve guidance and situational awareness on the airport surface for air traffic controllers, pilots, and vehicle drivers so as to prevent runway incursions and provide greater efficiency in the surface movements. In this regard, RTCA has compiled material on various aspects of airport surface operations. These include classification of airports and aircraft/vehicles, compilation of operational requirements, description of postulated system architecture, identification of performance requirements ; and assessment of GNSS performance. It is intended that this material be used in the further development of performance standards applicable to GNSS subsystems and equipment for use on the airport surface. At this time, the performance requirements for airport surface operations have been developed primarily through analytical means and are considered to be of a preliminary nature with further validation required through planned demonstration programs. These validation efforts need to be completed before performance standards (MASPS and MOPS) can be finalized.

The purpose of this report is to present the material that has been compiled on airport surface operations and relate it to the use of GNSS. It is intended that the report provide background information for airport operators/users and equipment suppliers on the role of GNSS to support airport surface operations, and to provide guidance for the further development of performance standards.

1.2 Advanced Surface Movement Guidance and Control Systems

A viable A-SMGCS functional architecture (Figure 1-1) must support the primary functions of surveillance, routing, guidance and control. In addition, the architecture must provide for the timely exchange of operationally essential information between the various system elements and users. At any given airport, the development and implementation of a particular A-SMGCS architecture should take into consideration current and future operational goals. That is, the capability required in order to safely and efficiently support a given number of surface movements given the visibility and traffic density likely to be encountered, as well as the complexity and existing equipage of the airport itself.