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# Guidance Material:
# Navigation Gaps for Unmanned Aircraft Systems (UAS)

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Prepared by: SC-228
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## FOREWORD

This document was prepared by Special Committee 228 (SC-228) and approved by the RTCA Program Management Committee (PMC) on September 15, 2022.

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- 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 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 and the International Telecommunication Union and other appropriate international organizations can be based.

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# EXECUTIVE SUMMARY

This document was prepared by RTCA Special Committee 228 (SC-228). It was approved by the RTCA Program Management Committee (PMC) on September 15, 2022.

This document is laying the initial groundwork to identify gaps in the navigation systems and standards that if filled may better support UAS operations. While all possible future UAS operations is a very broad topic, to limit scope and provide near term focus, this document intentionally is focused on identifying navigation gaps associated with near term IFR and VFR-Like planned path UAS operations for higher risk category fixed wing aircraft operating in and out of traditional airports. Note that IFR and VFR-Like operations as discussed in this document incorporate either waivers and/or alternate means of compliance to 14 CFR Part 91 and/or have limitations on their operational freedom enabling these operations. Potential future modifications to the VFR and IFR flight rules may enable these operations without waivers, alternate means of compliance, or limitations.

SC-228 is doing this work to identify navigation gaps, so that once the gaps are identified, appropriate efforts can be done to prioritize and close the gaps. SC-228 does not intend to develop UAS navigation equipment MOPS standards within the special committee. Instead, SC-228 intends to: a) apply existing navigation standards to UAS, b) identify navigation gaps when applying the existing navigation standards to UAS aircraft, and c) make recommendations to the RTCA PMC and/or other navigation standards committees to develop modified or new navigation equipment standards that appropriately address the identified navigation gaps such that the modified or new navigation standards can be applied. It is widely recognized that operational capabilities enabled and standards/systems initially developed to support the needs of UAS (e.g., UAS Detect and Avoid Systems, navigation systems, etc.) may result in broader applicability beyond UAS, including but not limited to manned aviation.

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# 1 INTRODUCTION

This document was developed by RTCA Special Committee (SC)-228 and is entitled: "Guidance Material: Navigation Gaps for Unmanned Aircraft Systems." It builds on RTCA/DO-304A (entitled "Guidance Material and Considerations for Unmanned Aircraft Systems"), focusing on the navigation systems.

*Note 1: Refer to DO-304A (Section 1.1) for a description of an Unmanned Aircraft System including its constituent segments, internal and external interfaces, and relationship to the term Remotely Piloted Aircraft System (RPAS) that has been adopted by the International Civil Aviation Organization (ICAO).*

*Note 2: This document is declared as "guidance material" since it is an informative document and not a document that defines system specifications or requirements.*

## 1.1 Purpose of Document

This Unmanned Aircraft Systems (UAS) navigation guidance document is intended to educate the community and be used to facilitate future discussions on navigation standards appropriate to support UAS operations. This document is not intended to be the basis for airworthiness certification and operational approval of UAS, a responsibility for civil UAS that lies with the Federal Aviation Administration (FAA) and other Civil Aviation Authorities (CAAs). The UAS manufacturers and operators will be responsible for meeting the airworthiness certification and operational approvals appropriate to the intended use of the UAS.

## 1.2 Scope of Document

This document is laying the initial groundwork to identify gaps in the navigation systems and standards that if filled may better support UAS operations. While all possible future UAS operations is a very broad topic, to limit scope and provide near term focus, this document intentionally is focused on identifying navigation gaps associated with near term IFR and VFR-Like planned path UAS operations for higher risk category fixed wing aircraft operating in and out of traditional airports.

*Note 1: See Section 1.6.1 for the definition of VFR-Like. UAS operations under VFR require waivers, and/or alternative means of compliance to certain 14 CFR Part 91 regulations and/or have limitations on their operational freedom.*

*Note 2: Currently all UAS operations conducted under IFR require waivers, and/or alternative means of compliance to certain 14 CFR Part 91 regulations and/or have limitations on their operational freedom. The document was developed assuming that appropriate waivers, and/or limitations, and/or alternative means of compliance are in place that enable the UAS operations discussed in this document. All UAS operations conducted under IFR in this document are referred to solely as IFR. Future updates to 14 CFR may enable IFR UAS operations without waivers, alternative means of compliance, or limitations.*

SC-228 is doing this work to identify navigation gaps, so that once the gaps are identified, appropriate efforts can be done to prioritize and close the gaps. SC-228 does not intend to develop UAS navigation equipment MOPS standards. Instead, SC-228 intends to: a) apply

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