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GUIDANCE MATERIAL and CONSIDERATIONS for UNMANNED AIRCRAFT SYSTEMS

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FOREWORD

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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

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1 Introduction

It has been over 14 years between the first publication of this Guidance Material and the current revision. In that time, significant changes have occurred to the National Airspace System (NAS) of the United States and to the Civilian Aviation ecosystem around the world. Significant advances have also been made in the field of Unmanned Aircraft Systems (UAS), many of those advances were noted in the first edition of this document and made possible thanks to the work of several RTCA Special Committees. UAS and UAS-related technologies have become an integral part of the global aviation landscape. Building on the legacy of the past 20 years and looking forward to the next 20 years, this document aims to provide guidance for industry, regulators, researchers, and other members of the aviation community. There will be a day in the future where remote pilots will safely, securely, and efficiently operate aircraft all over the world, and will share the skies with aircraft flown by on/off-board pilots.

This guidance material is intended to educate the community and be used to facilitate future discussions on UAS standards. 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 desired use of the UAS.

In any discussion of UAS, it is first imperative to make it clear that the regulatory approach to civilian aviation is not monolithic and has always drawn distinctions based on a number of intrinsic and extrinsic factors. Over the past 20 years, by virtue of the fact that there has not been human life aboard, UAS have brought these distinctions into a sharper contrast and accelerated a need to formalize the so called safety continuum, that has always been a guiding principle in aviation. UAS must operate safely, securely, efficiently, and compatibly with all aircraft operations in the airspace so that the overall safety of the airspace is not degraded. Secondly, it is important to note that the role of the Pilot has changed and evolved over time, and by locating the pilot off-board the aircraft, the work to integrate UAS into non-segregated airspace has always brought into focus this particular issue. The International Civilian Aviation Organization (ICAO), in its guidance document Manual on Remotely Piloted Aircraft Systems (RPAS) (Doc 10019) on UAS, has drawn a distinction between RPAS and UAS that would not have a Remote Pilot in Command (RPIC). While this distinction does not place requirements or limitations on an individual designated the RPIC, it establishes the foundational regulation that an individual be ultimately responsible for the safety of the flight of the aircraft under their command.

When the first version of this guidance material was released, there was little common understanding of UAS in the civilian aviation community. Since 2007, a significant amount of advancement has occurred, thus this guidance material aims to build on regulatory framework that has been established by ICAO and the FAA, the technical standards developed by RTCA and other Standards Development Organizations (SDOs), and the aspirations of a large, mature, and vibrant industry. It provides a framework for developing standards through RTCA Special Committee (SC) – 228 and other Special Committees. This document reflects the key ideas which should go into development of future Minimum Aviation System Performance Standards (MASPS) and Minimum Operational Performance Standards (MOPS), but it is not intended to limit or restrict future thinking.

Figure 1-1 notionally shows the relationships between the activities of RTCA, aviation regulators, and other SDOs. While often not formally related, the standards development

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work of SC-228 going forward must be mindful of the standards that have come before, especially those accepted by the FAA and in active use by industry. As UAS-related technology matures and begins to be incorporated into legacy aircraft and enable new operational models, SC-228 will become more engaged with other SC's to adapt or modify legacy equipment and capabilities.

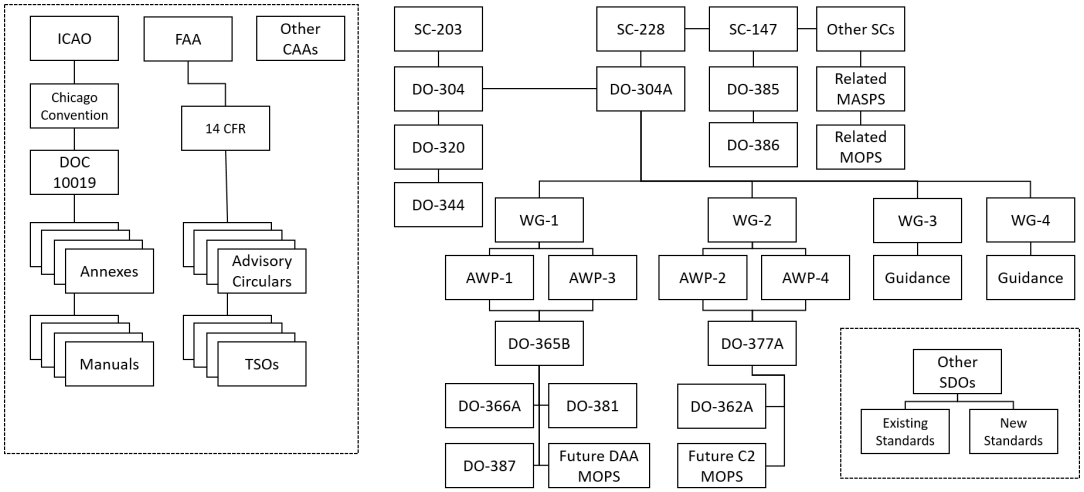


Figure 1-1 Relationship between UAS Guidance Material and Other SC 228 Documents

UAS have always had the potential to be as varied as aircraft operations are today with a pilot on-board, but today we see uses cases arising from the unique opportunities that arise when the pilot is removed from the aircraft. While this revision of DO-304 does not attempt to document every viable scenario, it does aim to document scenarios that have not been fully captured in the work of SC-228 to date. The specific technical implementation or design architecture to meet the defined operational and technical characteristics is left to the system designer. The operational and systems descriptions explored in this document are intended to assist in defining boundaries and should not be interpreted as an endorsement of any specific system or practice.

It is worth noting that SC-228's work to develop standards for Detect and Avoid (DAA) has been primarily focused on airborne conflicting traffic, and not the other hazards identified by ICAO as also being the subject of DAA capabilities.

The first revision of this document foresaw the need for a "UAS MASPS" that would cover a broad set of operational uses and aircraft architectures. Since 2007, the FAA has further refined its regulatory strategy, which will apply the appropriate level of rigor and oversight depending on the operation of the UAS in question. This approach has produced several new parts of 14 CFR and made the path to certification, pilot qualification, and operational approval more clear. In light of these developments, this revision seeks to highlight new operational scenarios and identify technology gaps where standards can help the industry meet the FAA's performance based regulations. The appropriate government agencies retain full discretion and responsibility for applying the information contained in this document to their regulatory functions.

Section 1 of this document provides background on UAS and the NAS. It also provides a set of assumptions that can be used as guiding principles and a broad set of safety considerations for UAS performance standards and designs.

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Section 2 describes UAS operational characteristics and differences from manned aircraft operations, and it serves as the foundation for future standards development. Included are considerations and high-level recommendations for reconciling differences with legacy aircraft operations.

Section 3 identifies gaps in existing standards as they apply to UAS and describes a methodology to be used to develop UAS standards.

Appendices are included to provide supplemental information related to the body of the document.

Appendix A, "UAS Hierarchy of Terms" provides a system hierarchy and associated definitions as they apply to this document.

Appendix B, "Terminology and Acronyms" provides definitions for terms used in this document. Included are sources used for the definitions.

Appendix C, "NAS Details" provides descriptions of airspace classes, air traffic facilities and services, airports, and the communication, navigation and surveillance infrastructure that comprise the NAS.

Appendix D, "Operational Functions" provides a list of UAS operational functions performed by aircraft, ground systems, or by persons during specific phases of flight. Included with each function are applicable regulatory or advisory reference sources, identified differences with manned operations, and high level recommendations relative to identified differences.

Appendix E, Reserved

Appendix F, "Representative UAS Mission Scenarios" includes a select set of operational scenarios provided to SC-228 for reference. These scenarios contain information on aircraft size, performance, equipage, and intended missions.

Appendix G, Reserved

Appendix H, Reserved

Appendix I, the first release of this DO-304 document was titled "Best Practices for Small Unmanned Aircraft Systems." However, due to publication of 14 CFR Part 107, the appendix is no longer relevant and has thus been removed in this document.

1.1 Unmanned Aircraft System Description

This section defines a UAS and its constituent segments and describes the UAS internal and external interfaces. Included are the following subsections:

- Unmanned Aircraft System Definition
- UAS Segments
- UAS Interfaces

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